

K-WONTS

SMART ENERGY GREEN REVOLUTION

BUSINESS AREA

Li-ion Battery Pack
Battery Management System
Powertrain & Control Systems (3kW, 5kW, 7kW)



01. OVERVIEW



HEAD OFFICE

Company Name	K-WONTS (TS60s)
Foundation Date	14th March, 2008
CEO	Sung Seok, Kang
Business Area	Li-ion Battery Pack & BMS & Powertrain
Capital	KRW 4,700,000,000
Homepage	www.k-wonts.com
Employee	41
Headquarter, R&D Center	Anyang-si, Gyeonggi-do, Republic of Korea
Factory	Cheonan-si, Chungcheongnam-do, Republic of Korea
Domestic Branch	Daema-myeon, Yeonggwang-gun, Jeollanam-do, Republic of Korea

US CORPORATION

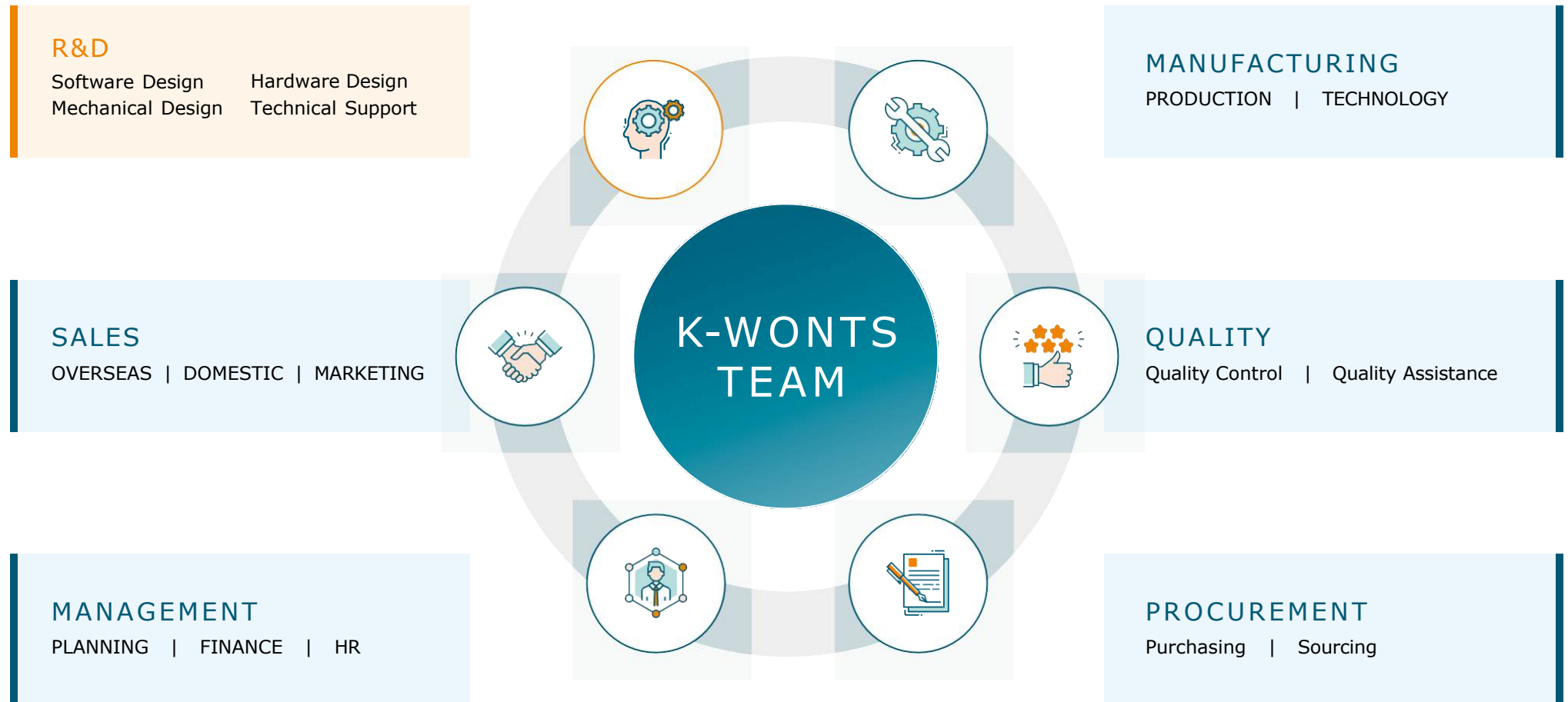
Company Name	TS60s US, Inc.
Location	Charleston, South Carolina, United States

INDONESIA CORPORATION

Company Name	PT. Kwon Tech Solution
Location	Jakarta, Indonesia

02. ORGANIZATION

R&D workforce **50%**
STRONG FOCUS ON R&D



03. HISTORY

2008 ~ 2011



2008

- Foundation.

TS60s
Lithium-ion Battery Solution Leader

2009

- IT Device Total Evaluation.

2010

- BMS Evaluation & Debugging.

2011

- BMS In-house Design.

2013 ~ 2016



2013

- BMS Supply for EV-Converted Truck (2 Model).
- National Type Approval granted.

2014

- Battery Pack Supply for Golf Cart.
- Battery Pack Supply for Defense.

2015

- BMS Supply for SKT Base Station.

2016

- BMS&PRA Supply for Railway Vehicles(KTX/Metro).

2017 ~ 2020



2017

- Battery Supply for Specialized Vehicles(AGV, AMR, etc.).

2018

- Battery Pack Development for Micro EV.

2019

- Battery pack MP for Micro EV.

2020

- Entry into Small EV Market.

2021 ~



2021

- MP of Exchangeable Battery Pack.

2022

- MP of Battery Pack for Railway Vehicles

2023

- Standard Battery Development for E2W.
- Name Change: K-WONTS (Incorporated into KWON Group in 2021)

2025

- Acquired the electric two-wheeler motor production line from HYUNDAI KEFICO, a subsidiary of Hyundai Motor Group

04. K-WON GROUP



05. BUSINESS AREA

WHERE CUSTOMERS START THEIR JOURNEY FOR BATTERY SOLUTIONS.

Providing optimal battery solutions across various areas with outstanding in-house BMS technology.

01



ELECTRIC VEHICLE

- Electric Vehicle: Micro EV, E2W/E3W/E4W mobility
- Utility Vehicle: Golf Cart, AGV, AMR, Food Cart, etc.
- Special Vehicle: Defense

02



RAILWAY & TELECOM

- Railway Vehicles: KTX(Train), Metro
- Telecommunication Base Station
- Solar Streetlight System

03



ENERGY STORAGE SYSTEM

- Portable ESS
- ESS for Power Generation Companies
- Industrial/Home ESS
- Grid-Connected/Off-grid
- MWh Scale ESS
- UPS

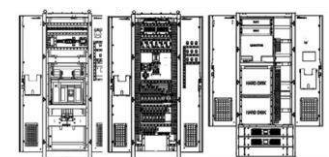
04



HYBRID BMS

- Integrated Control for Redox Flow & Li-ion Batt.
- Expandable Multi-cell Control Algorithms
- Diagnosis of SOC/SOH
- Battery Status Monitoring and Balancing

05



BCP

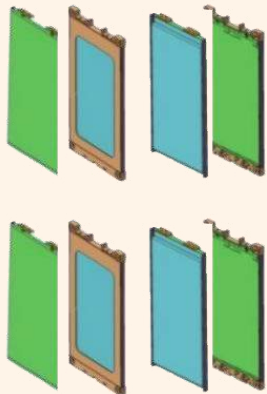
- Battery Control Panel
- DCP, ACP, BSC
- Gateway Board

06. TECHNOLOGY –BMS(BATTERY MANAGEMENT SYSTEM)

ALL AT ONCE

ALL-IN-ONE BATTERY SOLUTION FROM CELL TO PACK WITH
IN-HOUSE BMS DESIGN TECHNOLOGY.

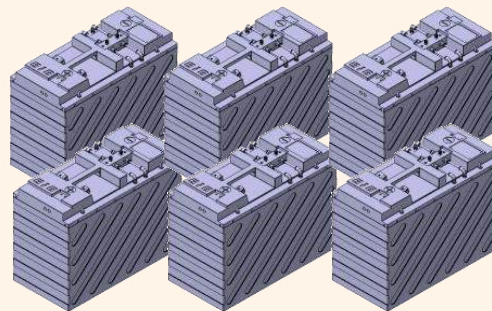
BMS.....Electrical Parts.....Mechanical Parts.....Others



Cell



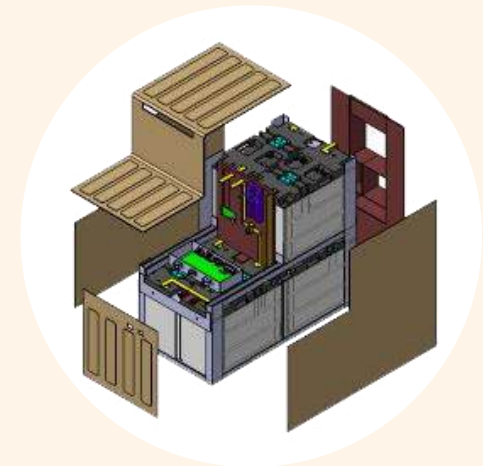
BMS



Module



Master BMS



Battery Pack

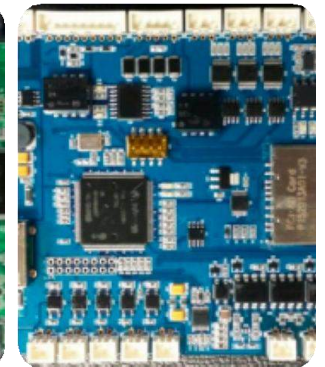
PROVED RELIABILITY AND ACCURACY OF K-WONTS BATTERY PACK SYSTEM.

- K-WONTS Battery is supplied to the national grid-based sectors such as Communication and Railway.

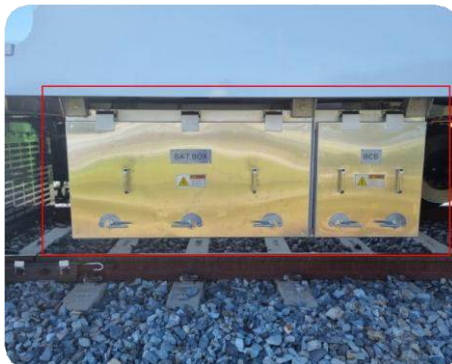
• EMU-150, KORAIL •



• 48V, 1050Ah / 24V, 2100Ah •



• Line 4, Seoul Metrol •

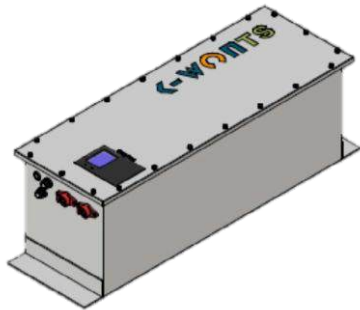


• Base Station / Metro Station •



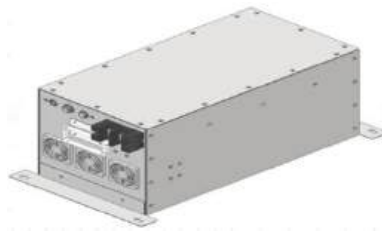
07. TECHNOLOGICAL CAPABILITY II

EXPERIENCE IN APPLYING VARIOUS APPLICATIONS.



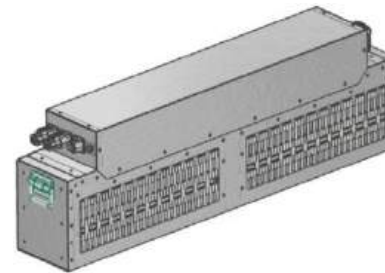
Golf Cart

50.8V / 120Ah



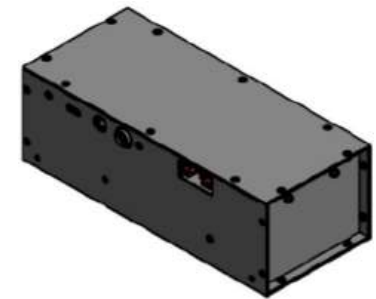
AGV

50.96V / 96Ah



Utility Truck

349V / 43.2Ah



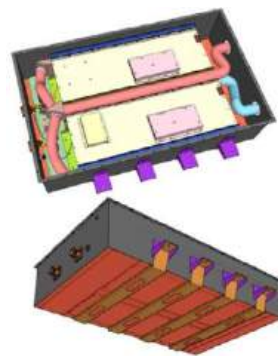
AMR

25.4V / 38.4Ah



Broadcast Equipment

51.1V / 344Ah



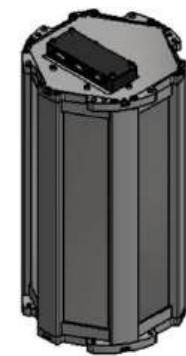
Small EV

349.4V / 129.6Ah



Tricycle

72.8V / 33.6Ah



Intelligent Pig

58V / 25Ah

07. TECHNOLOGICAL CAPABILITY III

VARIOUS ESS SOLUTION EXPERIENCE.

Portable ESS



ESS for Home 3kW, 5kW



ESS for Office 10kW



ESS for Power Plant 100kW ~ 1MW



07. TECHNOLOGICAL CAPABILITY IV

VARIOUS FORKLIFTS / AGV(AUTOMATED GUIDED VEHICLE) / AMR(AUTONOMOUS MOBILE ROBOT)



AGV

1.25ton



Forklift Type AGV

1ton



Forklift Type AGV

1ton



AMR

1.2ton



AGV

2ton



Dual Forklift

2ton



AGV

1.5ton

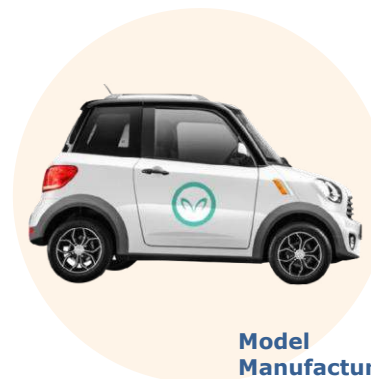


Coil AGV

65ton

SPECIALIZED BATTERY PACK MANUFACTURER FOR E-MOBILITY.

- Micro EV / Light EV / Small EV: Certified by the Ministry of Land, Infrastructure, and Transport / Ministry of Environment.
- Considerable experience in Certifications (14 models) / Several years of field operation experience.
- Assure Development and Certification within customer-specified timelines.

Model
ManufacturerHIM
MASTAModel
ManufacturerPM100
CEVOModel
ManufacturerPOTRO
DPECOModel
ManufacturerOnion
MVLModel
ManufacturerMAiV
MAiVModel
ManufacturerCarver
DSEV

RAILWAY VEHICLE BATTERY PACK.

- Started Rail Vehicle-related business in 2015 (Indirect).
- Direct engagement in Railway Vehicle business in 2020.

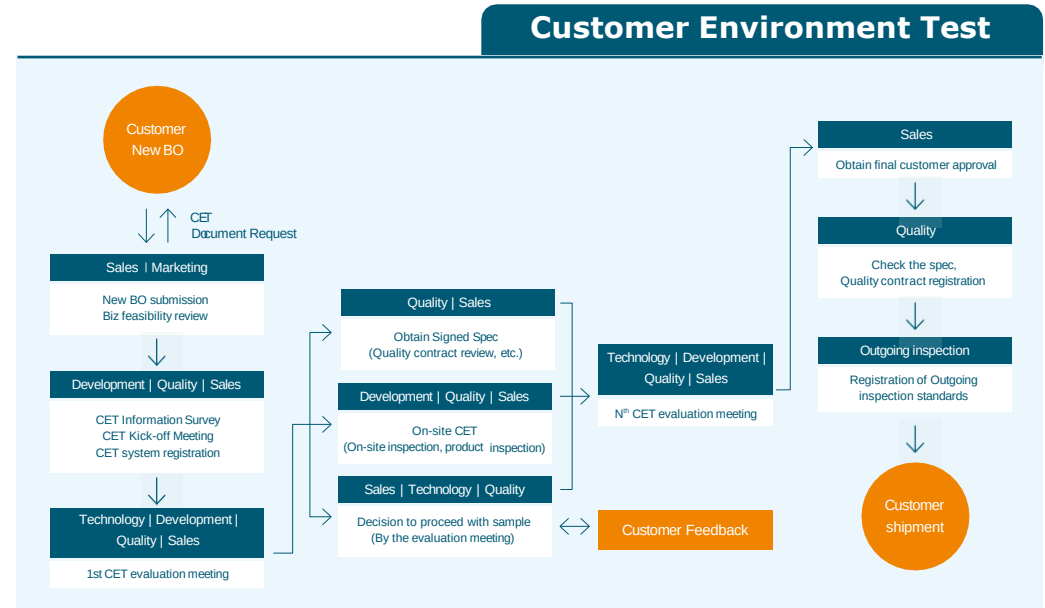
PROJECT	CLIENT	SPECIFICATIONS	DATE	SUPPLIED ITEMS
150 units for Wonju-Gangneung Line	HYUNDAI ROTEM	DC 82V/ 200Ah	2015.11	· BMS · Communication S/W
KORAIL Electric Car Improvement Project	KORAIL	DC 92.5V/ 100Ah	2015.11	· BMS · Communication S/W
46 units for Gimpo Light Rail	HYUNDAI ROTEM	DC 92.5V/ 100Ah	2015.04	· BMS · Communication S/W
48 units for Seongnam-Yeou Line	HYUNDAI ROTEM	DC 92.5V/ 100Ah	2017.12	· BMS · Communication S/W
40 units for Donghae-Nambu Line	HYUNDAI ROTEM	DC 92.5V/ 100Ah	2017.12	· BMS · Communication S/W
150 units for EMU-150	DAWONSYS	DC 91.3V/ 200Ah	2020.02	· Battery System · Battery Exterior Case · Backup Power Battery System
210 units for Seoul Metro Line 4	DAWONSYS	DC 92.0V/ 100Ah	2022.03	· Battery System · Battery Exterior Case

07.



K-WONTS IS THE 1ST CET CERTIFIED
COMPANY BY SAMSUNG SDI FOR
ELECTRIC VEHICLES.

- CET(Customer Environment Test):
Samsung SDI certification via Full Audit and Several Intensive Process.
- K-WONTS : First company in the EV sector
to be CET certified by Samsung SDI
- Traceability Management:
From Cell level to manufacturing process via data base.
- Benefit:
Stable Cell Delivery.
Access to the latest SDI technology.
Priority Supply of New Products.



APPROVED FOR THE USE OF LG ENERGY
SOLUTION CELL

- Secured Factory Process and Product Compliance Certification of LGES

LG's NEW ASSESSMENT PROCESS

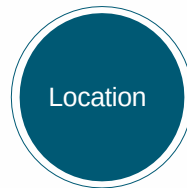
[PROCESS]	[DETAILS]	[DUE]
I. New Customer Approval (Once per Customer)		
- Step 1. Pre-Survey Data	Basic Information, Facilities Photos by Customer	2 Weeks Before Meeting
- Step 2. Audit Checklist + Q&A	To Be Completed by Customer in Advance	1 Week Before Meeting
- Step 3. Company Meeting	Discussions of Agenda Items	
- Step 4. Facility Tour + Audit Checklist	Data Logging By GIMS	
↓		
Production & Inventory Management Report	To Be Submitted to LG by GIMS	Within 1 Week After Meeting
II. Project Approval		
- Customer Check Sheet	Battery Pack Design Review	
III. Post-Sales Process (For Every PO Delivered)		
- Warehouse Management Report	Inventory Status of LG Cells Delivered	Monthly

LGI, Plant, Tower 1, 100 Wondol-daero, Yeongtong-gu, Seoul 07059, Korea
 May 20th, 2022
Letter of Authorization
 To: KAWONTS
 Attention: Mr. Jeongmin Park, 1F, Tower A, 360, Jeongmin-ro, Gyeonggi-do, Gyeonggi-do, Korea
 From: LG Energy Solution Ltd. (LSES)
 LG Energy Solution LTD ("LSES") hereby, authorizes the use of INPOTIS MIBIT by KAWONTS under the conditions set forth below:
 1. Related LG INPOTIS MIBIT
 2. Application Cost Card
 3. Battery Pack Configuration 1-023P
 4. Battery Pack Manufacturer: KAWONTS
 Hence, the LSES would like to authorize KAWONTS ("KAWONTS") as the agent to sell INPOTIS MIBIT to KAWONTS. The quality of INPOTIS MIBIT sold from LSES to KAWONTS will be guaranteed by LSES.
 Thank you very much and have a nice day.
 Best Regards,

 Chris Sim / Team Leader
 LG Energy Solution Inc.

08. PRODUCTION CAPACITY

1,000 BATTERY PACK(6,000KWH) / MONTH (BASED ON 6KWH PACK).



21, Baekseokgongdan 4-gil,
Seobuk-gu, Cheonan-si,
Chungcheongnam-do,
Republic of Korea.



2,919
Square meters



EV-Specific Cell Grading System.
Battery Cell Welding Machine.
Battery Pack Tester.
Power Supply/Loader.
EV-Specific Screw/Torque Tool.



Production Line



Outgoing Inspection



Material Management

08. K-WONTS BATTERY PACK MODEL I



01
TBP-K206



PROJECT(APPLICATION)	Wiring Truck
BMS	TB-K076-6V0
TOTAL ENERGY	4.79kWh
CELL CONFIGURATION	14S / 28P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	50.4V
CAPACITY	95.2Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	350 x 487 x 200
WEIGHT[kg]	37

02
TBP-K210



PROJECT(APPLICATION)	AGV
BMS	TB-K089-1_2V0
TOTAL ENERGY	1.02kWh
CELL CONFIGURATION	7S / 12P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	25.2V
CAPACITY	40.8Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	335 x 190 x 110
WEIGHT[kg]	6.8

03
TBP-K216



PROJECT(APPLICATION)	Agricultural Transport Vehicle
BMS	TB-K091-5V0
TOTAL ENERGY	6.85kWh
CELL CONFIGURATION	20S / 28P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	72.0V
CAPACITY	95.2Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	262 x 780 x 246(Includes Bracket)
WEIGHT[kg]	50.8

04
TBP-K220



PROJECT(APPLICATION)	Golf Cart
BMS	TB-K091-5V0
TOTAL ENERGY	9.79kWh
CELL CONFIGURATION	20S / 40P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	72.0V
CAPACITY	136.0Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	262 x 780 x 246(Includes Bracket)
WEIGHT[kg]	50.8

05
TBP-K225A



PROJECT(APPLICATION)	UPS
BMS	TB-K108_2V0
TOTAL ENERGY	0.79kWh
CELL CONFIGURATION	13S / 5P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	46.8V
CAPACITY	17.0Ah
COMMUNICATION	TCP-IP / CAN2.0
SIZE[mm] W x D x H	230 x 282 x 129
WEIGHT[kg]	15.2

06
TBP-K225B



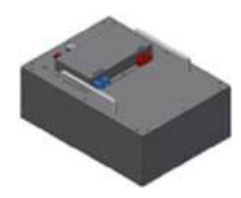
PROJECT(APPLICATION)	UPS
BMS	TB-K108_2V0
TOTAL ENERGY	1.27kWh
CELL CONFIGURATION	13S / 8P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	46.8V
CAPACITY	27.2Ah
COMMUNICATION	TCP-IP / CAN2.0
SIZE[mm] W x D x H	230 x 282 x 129
WEIGHT[kg]	17.1

07
TBP-J227



PROJECT(APPLICATION)	AGV
BMS	TB-K076_6V0
TOTAL ENERGY	4.45kWh
CELL CONFIGURATION	7S / 52P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	25.2V
CAPACITY	176.8Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	176 x 441 x 340
WEIGHT[kg]	35.1

08
TBP-K231



PROJECT(APPLICATION)	AGV
BMS	TB-K089-1_2V0
TOTAL ENERGY	1.71kWh
CELL CONFIGURATION	7S / 20P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	25.2V
CAPACITY	68.0Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	250 x 345 x 157
WEIGHT[kg]	15.7

08. K-WONTS BATTERY PACK MODEL II

09

TBP-K232



PROJECT(APPLICATION)

BMS

TOTAL ENERGY

CELL CONFIGURATION

CELL SPEC.

VOLTAGE

CAPACITY

COMMUNICATION

SIZE[mm] W x D x H

WEIGHT[kg]

Cleaning Cart/Car

TB-K076_6V0

8.81kWh

10S / 72P

SDI INR18650-35E

36.0V

244.8Ah

RS232 / CAN2.0

449 x 500 x 311

52.3

10

TBP-K233



Golf Cart

TB-K131_1V0

7.11kWh

14S / 28P

SDI INR21700-50G

50.82V

140Ah

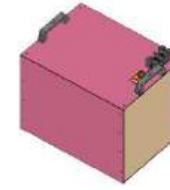
RS232 / CAN2.0

262 x 875 x 265

50.8

11

TBP-K235



Cleaning Cart/Car

TB-K076-6V0

4.45kWh

7S / 52P

SDI INR18650-35E

25.2V

176.8Ah

RS232 / CAN2.0

323 x 350 x 299

34.5

12

TBP-K240



Cleaning Cart/Car 48V 9KWh

TB-K076_6V0

10.28kWh

14S / 60P

SDI INR18650-35E

50.4V

204.0Ah

RS232 / CAN2.0

299 x 935 x 260

70.5

13

TBP-K243



PROJECT(APPLICATION)

BMS

TOTAL ENERGY

CELL CONFIGURATION

CELL SPEC.

VOLTAGE

CAPACITY

COMMUNICATION

SIZE[mm] W x D x H

WEIGHT[kg]

Cleaning Cart/Car

TB-K076_6V0

1.88kWh

7S / 22P

SDI INR18650-35E

25.2V

74.8Ah

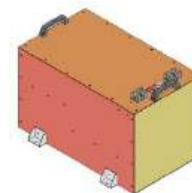
RS232 / CAN2.0

320 x 340 x 250

18.7

14

TBP-K244



Large Cleaning Cart/Car

TB-K076_6V0

3.59kWh

7S / 42P

SDI INR18650-35E

25.2V

142.8Ah

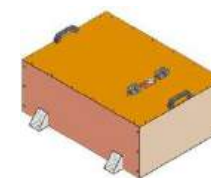
RS232 / CAN2.0

359 x 520 x 340

35.9

15

TBP-K245



Cleaning Cart/Car

TB-K076_6V0

6.36kWh

10S / 52P

SDI INR18650-35E

36.0V

176.8Ah

RS232 / CAN2.0

550 x 630 x 270

55.1

16

TBP-K252



AGV

TB-K089_2V0

1.90kWh

13S / 12P

SDI INR18650-35E

46.8V

40.8Ah

RS232 / CAN2.0

190 x 670 x 110

13.4

08. K-WONTS BATTERY PACK MODEL III

17

TBP-K258



PROJECT(APPLICATION)	Micro EV(Masta)
BMS	TB-K118
TOTAL ENERGY	10.16kWh
CELL CONFIGURATION	20S / 28P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	72.6V
CAPACITY	140Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	393 x 880 x 202
WEIGHT[kg]	79.4

18

TBP-K261



PROJECT(APPLICATION)	AGV
BMS	TB-K089_2V0 181127
TOTAL ENERGY	1.91kWh
CELL CONFIGURATION	13S / 12P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	46.8V
CAPACITY	40.8Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	169 x 350 x 168
WEIGHT[kg]	14.8

19

TBP-K262



PROJECT(APPLICATION)	AGV
BMS	TB-K089_2V0 181127
TOTAL ENERGY	1.99kWh
CELL CONFIGURATION	13S / 12P
CELL SPEC.	LG INR18650-MJ1
VOLTAGE	47.45V
CAPACITY	42Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	190 x 566 x 110
WEIGHT[kg]	12.6

20

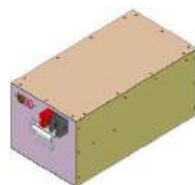
TBP-K267



PROJECT(APPLICATION)	AGV
BMS	TB-K119_1V0
TOTAL ENERGY	1.71kWh
CELL CONFIGURATION	7S / 20P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	25.2V
CAPACITY	68Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	349 x 324 x 198
WEIGHT[kg]	18.7

21

TBP-K272



PROJECT(APPLICATION)	AGV
BMS	TB-K076-1_2V0
TOTAL ENERGY	4.07kWh
CELL CONFIGURATION	7S / 32P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	25.41V
CAPACITY	160Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	271 x 558 x 230
WEIGHT[kg]	37

22

TBP-K275



PROJECT(APPLICATION)	Agricultural Transport Vehicle
BMS	TB-K076_6V0
TOTAL ENERGY	6.85kWh
CELL CONFIGURATION	14S / 40P
CELL SPEC.	SDI INR18650-35E
VOLTAGE	50.4V
CAPACITY	136.0Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	262 x 780 x 246(Includes Bracket)
WEIGHT[kg]	49.5

23

TBP-K279



PROJECT(APPLICATION)	Forklift (Doosan)
BMS	TB-K076_6V0
TOTAL ENERGY	14.52kWh
CELL CONFIGURATION	10S / 80P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	36.3V
CAPACITY	400Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	247 x 840 x 390
WEIGHT[kg]	93.3

24

TBP-K280A



PROJECT(APPLICATION)	Micro EV
BMS	TB-K124_3V0
TOTAL ENERGY	10.16kWh
CELL CONFIGURATION	20S / 28P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	72.6V
CAPACITY	140Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	452 x 1027 x 214
WEIGHT[kg]	72.5

08. K-WONTS BATTERY PACK MODEL IV

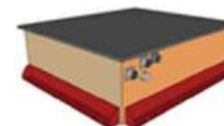
25
TBP-K280B



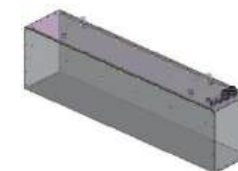
26
TBP-K282



27
TBP-K283



28
TBP-K285



PROJECT(APPLICATION)

BMS

TOTAL ENERGY

CELL CONFIGURATION

CELL SPEC.

VOLTAGE

CAPACITY

COMMUNICATION

SIZE[mm] W x D x H

WEIGHT[kg]

Micro EV

TB-K124_3V0

10.16kWh

20S / 28P

SDI INR21700-50G

72.6V

140Ah

RS232 / CAN2.0

452 x 1027 x 214

72.5

Emergency Guidance System

TB-K124_3V0

0.84kWh

7S / 8P

SDI INR21700-41J

25.55V

32.8Ah

RS232 / CAN2.0

390 x 300 x 332

19.1

Micro EV

TB-K127_1V0

11.62kWh

20S / 32P

SDI INR21700-50G

72.6V

160Ah

RS232 / CAN2.0

594 x 654 x 200

88.1

72V_GOLF CART

TBA-091

7.83kWh

20S / 32P

SDI INR18650-35E

72V

108.8Ah

RS232 / CAN2.0

174 x 900 x 262

56

29
TBP-K287



30
TBP-K288



31
TBP-K289



32
TBP-K290



PROJECT(APPLICATION)

BMS

TOTAL ENERGY

CELL CONFIGURATION

CELL SPEC.

VOLTAGE

CAPACITY

COMMUNICATION

SIZE[mm] W x D x H

WEIGHT[kg]

Camping Car

TB-K120_2V0

3.35kWh

7S / 32P

SDI INR21700-41J

25.55V

131.2Ah

RS232 / CAN2.0

250 x 430 x 267

24

Vending Machine Auxiliary Battery

TB-K125_2V0

1.02kWh

7S / 8P

SDI INR21700-50G

25.41V

40Ah

RS232 / CAN2.0

335 x 520 x 222

9.2

AGV

TB-K076_6V0

7.83kWh

14S / 32P

SDI INR21700-48X

50.96V

153.6Ah

RS232 / CAN2.0

300 x 831 x 300

67.5

AGV_NSE

TB-K119_2V0

2.10kWh

6S / 20P

SDI INR21700-48X

21.84V

96Ah

RS232 / CAN2.0

349 x 324 x 198

20.6

08. K-WONTS BATTERY PACK MODEL V



33

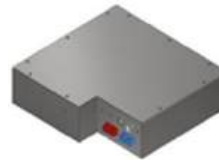
TBP-K294



PROJECT(APPLICATION)	AGV
BMS	TB-K076_6V0
TOTAL ENERGY	6.85kWh
CELL CONFIGURATION	14S / 28P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	50.96V
CAPACITY	134.4Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	300 x 570 x 288
WEIGHT[kg]	53.1

34

TBP-K296



PROJECT(APPLICATION)	AGV
BMS	TB-K089-1_2V0
TOTAL ENERGY	1.02kWh
CELL CONFIGURATION	7S / 8P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	25.41V
CAPACITY	40Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	333 x 311 x 90
WEIGHT[kg]	9.3

35

TBP-K298



PROJECT(APPLICATION)	Golf Cart
BMS	TB-K131_1V0
TOTAL ENERGY	8.13kWh
CELL CONFIGURATION	14S / 32P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	50.82V
CAPACITY	160Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	262 x 875 x 265
WEIGHT[kg]	55.4

36

TBP-K300



PROJECT(APPLICATION)	Micro EV (MAIV)
BMS	TB-K124_3V0
TOTAL ENERGY	10.16kWh
CELL CONFIGURATION	20S / 28P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	72.6V
CAPACITY	140Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	299 x 940 x 219
WEIGHT[kg]	74.6

37

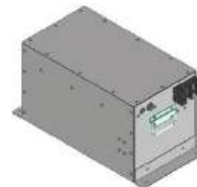
TBP-K305



PROJECT(APPLICATION)	Micro EV_13kW(MASTA)
BMS	TB-K136_1V0
TOTAL ENERGY	13.07kWh
CELL CONFIGURATION	20S / 36P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	72.6V
CAPACITY	180Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	864 x 751 x 175
WEIGHT[kg]	94.3

38

TBP-K307



PROJECT(APPLICATION)	Golf Cart
BMS	TB-K131_1V0
TOTAL ENERGY	5.08kWh
CELL CONFIGURATION	14S / 20P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	50.82V
CAPACITY	100Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	247 x 519 x 260
WEIGHT[kg]	36.9

39

TBP-K310



PROJECT(APPLICATION)	AGV
BMS	TB-K076-1_2V0
TOTAL ENERGY	4.89kWh
CELL CONFIGURATION	14S / 20P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	50.96V
CAPACITY	96Ah
COMMUNICATION	RS485 / RS232 / CAN2.0
SIZE[mm] W x D x H	484 x 247.2 x 260
WEIGHT[kg]	37.7

40

TBP-K312A



PROJECT(APPLICATION)	Golf Cart
BMS	TB-K131-3V0
TOTAL ENERGY	6.10kWh
CELL CONFIGURATION	14S / 24P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	50.82V
CAPACITY	120Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	201 x 769 x 265
WEIGHT[kg]	44.9

08. K-WONTS BATTERY PACK MODEL VI

41
TBP-K315



PROJECT(APPLICATION)	AGV
BMS	TB-K089_2V0
TOTAL ENERGY	1.89kWh
CELL CONFIGURATION	13S / 8P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	47.19V
CAPACITY	40Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	192 x 432 x 160
WEIGHT[kg]	15.2

42
TBP-K316A



PROJECT(APPLICATION)	Micro EV Truck(Fast Charging Model)
BMS	TB-K139 TB-K140-2 TB-K141
TOTAL ENERGY	15.10kWh
CELL CONFIGURATION	96S / 9P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	349.44V
CAPACITY	43.2Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	935 x 1032 x 317
WEIGHT[kg]	106

43
TBP-K316B



PROJECT(APPLICATION)	Micro EV Truck(Slow Charging Model)
BMS	TB-K139 TB-K140-2 TB-K141
TOTAL ENERGY	15.10kWh
CELL CONFIGURATION	96S / 9P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	349.44V
CAPACITY	43.2Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	935 x 1032 x 317
WEIGHT[kg]	106

44
TBP-K316C



PROJECT(APPLICATION)	Micro EV Truck(Fast Charging Model)
BMS	TB-K139 TB-K140-2 TB-K141
TOTAL ENERGY	15.10kWh
CELL CONFIGURATION	96S / 9P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	349.44V
CAPACITY	43.2Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	935 x 1032 x 317
WEIGHT[kg]	106

45
TBP-K317



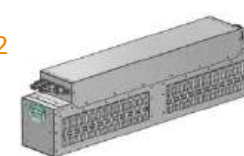
PROJECT(APPLICATION)	HVAC Battery Pack(Twizy)
BMS	TB-K138-1 TB-K138-2
TOTAL ENERGY	2.54kWh
CELL CONFIGURATION	7S / 20P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	25.41V
CAPACITY	100Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	105 x 434 x 271
WEIGHT[kg]	16

46
TBP-K319B



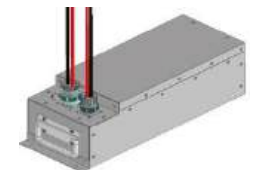
PROJECT(APPLICATION)	TUKTUK(Electric 3-Wheeler)
BMS	TB-K142 TB-K142-1
TOTAL ENERGY	2.45kWh
CELL CONFIGURATION	20S / 7P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	72.8V
CAPACITY	33.6Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	W:185x L:185xD:328
WEIGHT[kg]	15.3

47
TBP-K322



PROJECT(APPLICATION)	EV-Refrigeration Unit
BMS	TB-K139 TB-K140(TB-K140-2 대체)
TOTAL ENERGY	15.10kWh
CELL CONFIGURATION	96S / 9P
CELL SPEC.	SDI INR21700-48X
VOLTAGE	349.44V
CAPACITY	43.2Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	227 x 1346 x 340
WEIGHT[kg]	88.7

48
TBP-K327



PROJECT(APPLICATION)	AMR
BMS	TB-K089-1_2V0
TOTAL ENERGY	0.64kWh
CELL CONFIGURATION	7S / 5P
CELL SPEC.	SDI INR21700-50G
VOLTAGE	25.41V
CAPACITY	25Ah
COMMUNICATION	RS232 / CAN2.0
SIZE[mm] W x D x H	149 x 399 x 129
WEIGHT[kg]	7

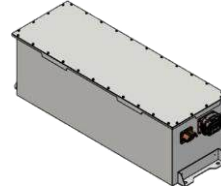
08. K-WONTS BATTERY PACK MODEL VII



49
TBP-K328



50
TBP-K329



51
TBP-K331



52
TBP-K335



PROJECT(APPLICATION)

BMS

TOTAL ENERGY

CELL CONFIGURATION

CELL SPEC.

VOLTAGE

CAPACITY

COMMUNICATION

SIZE [mm] W x D x H

WEIGHT[kg]

Lightweight Electric Cargo Truck

TB-K139 TB-K140-1(TB-K140-3)

30.19kWh

96S / 18P

SDI INR21700-48X

349.4V

86.4Ah

RS232 / CAN2.0

936 x 1320 x 417

-

1 Ton Truck

TB-K139 TB-K140-1(TB-K140-3)

40.25kWh

96S / 24P

SDI INR21700-48X

349.4V

115.2Ah

RS232 / CAN2.0

409 x 1060 x 326 (M) 345 x 1060 x 322 (S)

136.1 (Master) / 134.1 (Slave)

Small Electric Cargo Truck

TB-K139 TB-K140-1(TB-K140-3)

45.28kWh

96S / 27P

SDI INR21700-48X

349.4V

129.6Ah

RS232 / CAN2.0

936 x 1320 x 417

-

AGV

TB-K089-1_2V0

0.98kWh

7S / 8P

SDI INR21700-48X

25.48V

38.4Ah

RS232 / CAN2.0

372 x 160 x 127

12.6

53
TBP-K336



54
TBP-K337



55
TBP-K337B



56
TBP-K340



PROJECT(APPLICATION)

BMS

TOTAL ENERGY

CELL CONFIGURATION

CELL SPEC.

VOLTAGE

CAPACITY

COMMUNICATION

SIZE [mm] W x D x H

WEIGHT[kg]

Golf Cart_Standard Pack

TB-K147_1V0 TB-K148_1V0 TB-K149_1V0 TB-K150_1V0

6.10kWh

14S / 24P

SDI INR21700-50G

50.82V

120.0Ah

RS232 / CAN2.0

240 x 783 x 244

42.8

Electric 2-Wheeler Standard Pack (48V)

TB-K151_1V0 TB-K151-1_1V0

1.81kWh

14S / 7P

LG INR21700-M50L

51.66V

35Ah

RS232 / CAN2.0

170 x 135 x 310

10.3

Electric 2-Wheeler Standard Pack (72V)

TB-K091-5V0

1.85kWh

20S / 5P

LG INR21700-M50L

73.8V

25Ah

RS232 / CAN2.0

170 x 135 x 310

10.5

Golf Cart

TB-K131_3V0

6.20kWh

14S / 24P

LG INR21700-M50L

51.66V

120Ah

RS232 / CAN2.0

201 x 769 x 265

44.9

09. POWERTRAIN SYSTEM PORTFOLIO

- Acquired the electric two/three-wheeler motor production line (3kW in-wheel motor, 5kW inline motor, 7kW inline motor), along with the Motor Control Unit (MCU) and Vehicle Control Unit (VCU) from **HYUNDAI KEFICO**, a subsidiary of Hyundai Motor Group.
- With this expansion, our broader business vision is to manufacture and supply complete **Battery Pack (including BMS) & Powertrain/Control/Cooling Systems (Motors, MCU, VCU, DC-DC)** to manufacturers of electric two/three-wheelers, golf carts, and various E-Mobility vehicles - offering a One-Stop Total Solution for the core components of E-Mobility.

In-Wheel Motor 3kW



3kW In-Wheel Motor



MCU

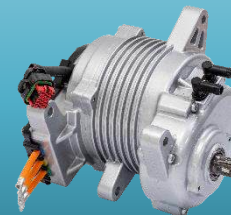


VCU



DC-DC Converter

In-Line Motor 5kW



In-Line Motor



MCU



VCU



DC-DC Converter

In-Line Motor 7kW



In-Line Motor



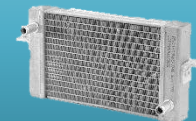
MCU



VCU



DC-DC Converter



Radiator



Reservoir Tank



EWP

10. IN-WHEEL MOTOR 3kW (3.0~5.4kW)



Main Specification

Product	Specification	
Motor	Type	PMSM (In-Wheel)
	Cooling	Passive Cooling
	Max. Power	3.0 ~ 5.4 kW
	Max. Torque	125 Nm
	Sensor	Hall Sensor
MCU	Cooling	Passive Cooling
	Drive Type	3 Phase Inverter (FOC)
	Max Input Voltage range	70V ~ 120V
VCU	Hardware	Multi-I/O, Communications (CAN, BLE5.0, 3G/LTE, GPS)
	Software	Model-based Control
	Functions	Torque-based control Vehicle diagnostic monitoring Wireless communication
DC/DC Converter	Input Voltage	42V-120V
	Output Voltage	14V
System Voltage (Battery)	Voltage	48V, 60V, (72V), 96V
	Type	Lithium-ION
BMS	Cell Balancing	Passive

Performance Expectation



Description		Specification
EV 2Wheeler	Max Power [kW]	3.0 ~ 5.4 kW
	Max Torque [Nm]	125 Nm
	Rated Power [kW] (ECE R85, 30 Min Net Power)	2.0 ~ 3.2 kW
	Rated Torque [Nm] (ECE R85, 30 Min Net Power)	52 ~ 58 Nm
	IP code	IP67
	Max Speed [km/h] *	60.6 (48V) / 64.0 (60V) km/h
	Hill-climbing ability *	37.5%(21°) @ 5km/h
	Max. Acceleration *	9.4sec @ 0-50km/h (48V) 8.15sec @ 0-50km/h (60V)
	Drive type	In-Wheel
	Charge Method	Exchangeable (Swappable using from VCU)

10.

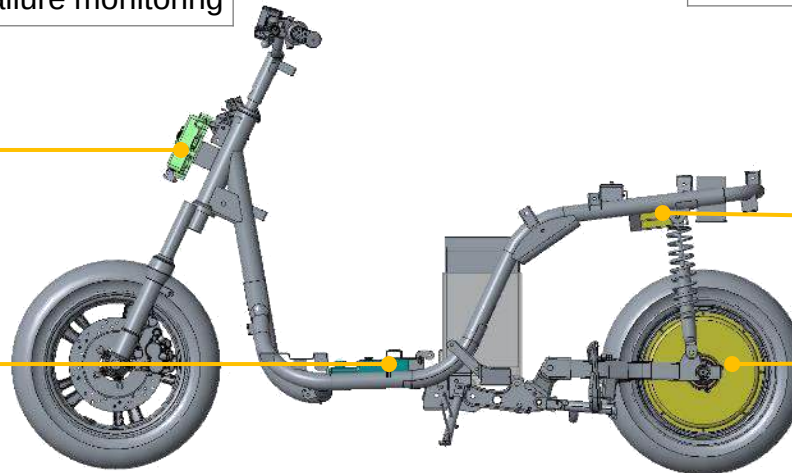
IN-WHEEL MOTOR 3kW (3.0~5.4kW)

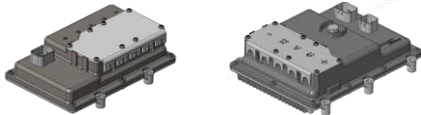
High Power, Alternative Voltage with passive cooled EV 2Wheeler

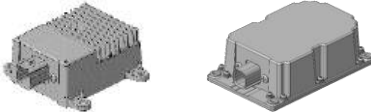
- Customer's requests; High speed/power + High Energy Efficiency + System safety

1	VCU (Vehicle Control Unit)
	- 32bit CPU applied - Torque control - Lamp/Actuator control - LTE/BLE communication - System failure monitoring

2	Motor (In-wheel type)
	- 3 Phase PMSM - 12 Inch in-wheel motor - High torque density - Passive cooling

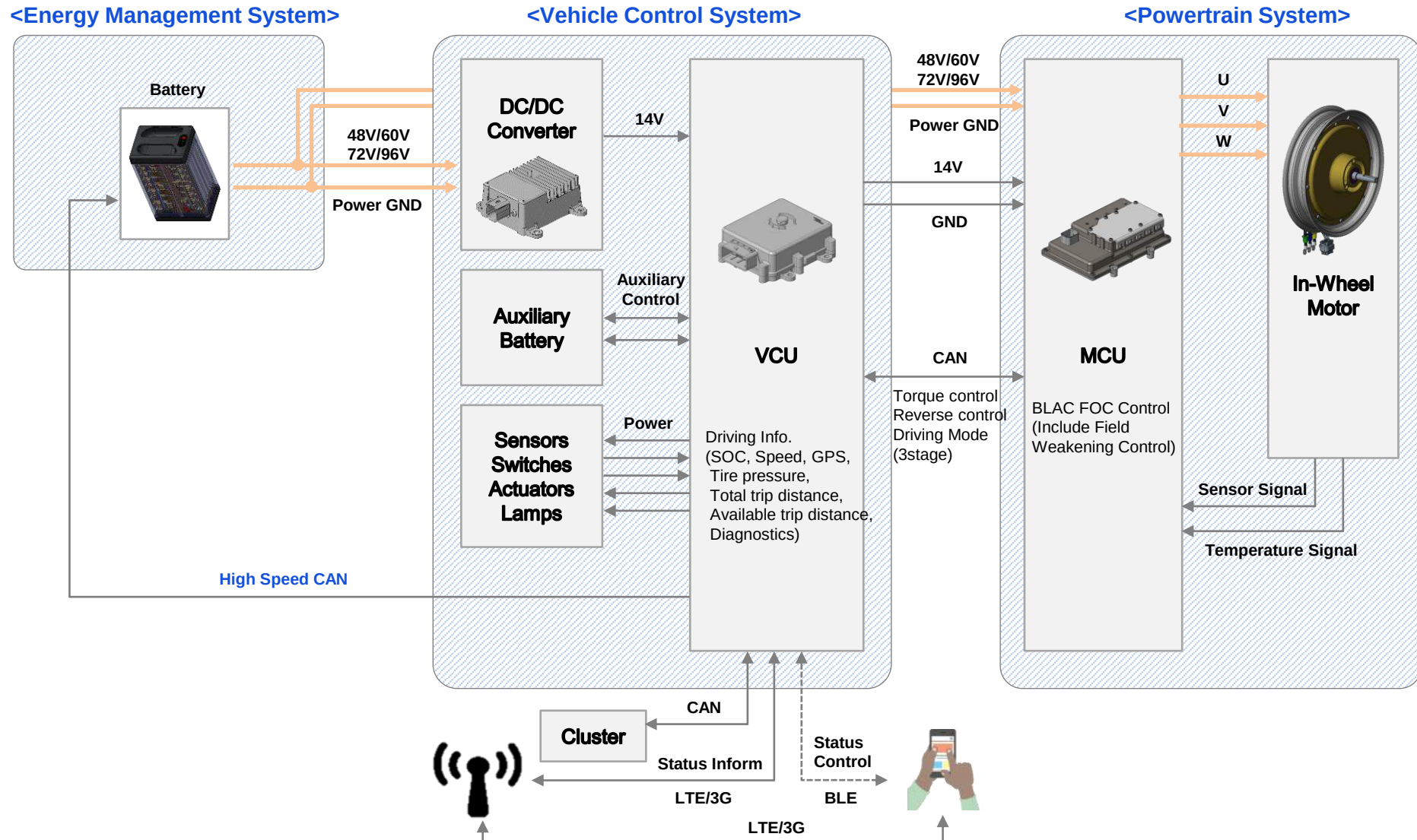


3	MCU (Motor Control Unit)
3-1 48V/60V/72V 3-2 96V 	- 3 Phase inverter - 32bit CPU applied - Part diagnosis - Passive cooling

4	DC/DC Converter
4-1 48V/60V/72V 4-2 96V 	- EMI/EMC compliant - Apply protection function

10. IN-WHEEL MOTOR 3kW (3.0~5.4kW)

System Management Diagram



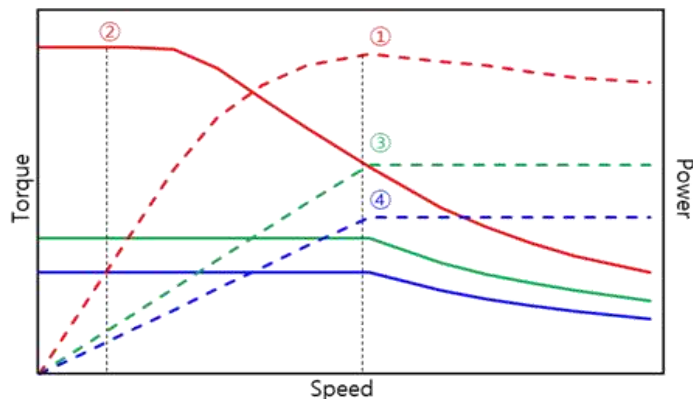
10.

IN-WHEEL MOTOR 3kW (3.0~5.4kW) : MOTOR

External size & features



- Size(mm) : Ø330 x 280



- 1) PMSM : Permanent magnet synchronous motor
- 2) SPM : Surface permanent magnet
- 3) Max. value within operating time
- 4) ECE R85, 30min Net Power

Specifications

Description		Specification			
Operating Temp.		-20°C ~ 60°C			
Storage Temp.		-20°C ~ 60°C			
Motor Type		PMSM ¹⁾ (3 Phase SPM ²⁾ type)			
Cooling Method		Passive cooling			
Position Sensor		Hall sensor			
IP code		IP67			
Rim size		12 x 2.15"			
System Voltage		51.8V	60V	72V	100V
Nominal					
①	Max. Power ³⁾ (1min)	3.0 kW (85A _{dc} @ 370rpm)	3.5 kW (85A _{dc} @ 400rpm)	4.0 kW (85A _{dc} @ 450rpm)	5.4 kW (75A _{dc} @ 570rpm)
②	Max. Torque ³⁾ (1min)	125 Nm (@ 57rpm)	125 Nm (@ 100rpm)	125 Nm (@ 150rpm)	125 Nm (@ 230rpm)
③	Power ⁴⁾ (30min)	2.0 kW (@ 370rpm)	2.4 kW (@ 400rpm)	2.6 kW (@ 450rpm)	3.2 kW (@ 570rpm)
	Torque ⁴⁾ (30min)	52 Nm (@ 370rpm)	58 Nm (@ 400rpm)	55 Nm (@ 450rpm)	54 Nm (@ 570rpm)
④	Power (continuous)	1.5 kW (@ 370rpm)	1.8 kW (@ 400rpm)	2.0 kW (@ 450rpm)	2.4 kW (@ 570rpm)
	Torque (continuous)	39 Nm (@ 370rpm)	43 Nm (@ 400rpm)	43 Nm (@ 450rpm)	41 Nm (@ 570rpm)

※ The data for 72V is estimated.

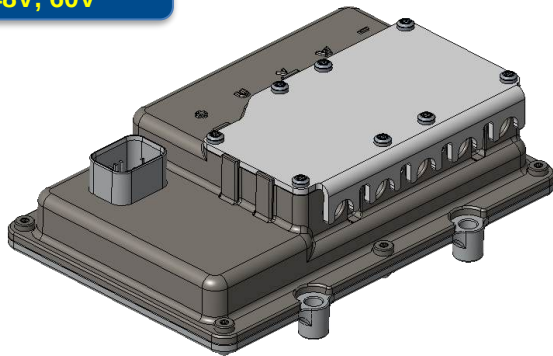
10.

IN-WHEEL MOTOR 3kW (3.0~5.4kW) : MCU



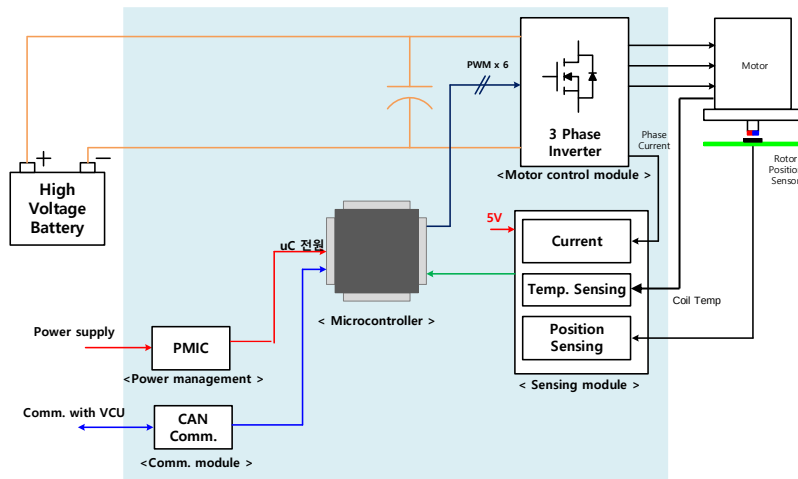
MCU External size

System voltage
48V, 60V



- Size(mm) : 210 x 139 x 65

Block Diagram



Specifications & Features

	Description	Specification	Remark
General	Operating Temp.	-20°C ~ 60°C	MCU ambient Temp.
	Storage Temp.	-20°C ~ 60°C	
	Cooling Method	Air cooled	-
	IP Code	IP67	-
Electrical	MCU Power	4.6kW	Max. Output Power ¹⁾
	Max. input voltage	70V	-
	Nominal drive Voltage range	42V ~ 68V	-
	Motor control	BLAC FOC ²⁾	Speed/Torque control
	PWM frequency	15kHz	-
	Communication	High speed CAN	500kbps Isolation CAN type

1) This value may change depending on system voltage

2) FOC : Field-Oriented Control (vector control)

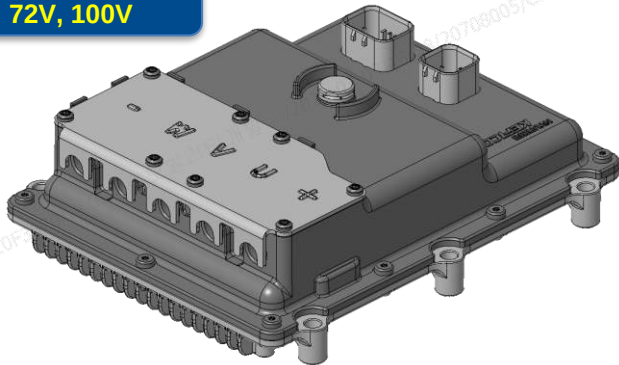
- 32bit microcontroller applied
- PWM control for optimize efficiency
- High efficiency(>95%), Low loss
- BLAC FOC Control (Include Field Weakening Control)
- Regeneration control for constant torque
- Air cooling housing for heat control
- Diagnosis on Motor and MCU

10.

IN-WHEEL MOTOR 3kW (3.0~5.4kW) : MCU

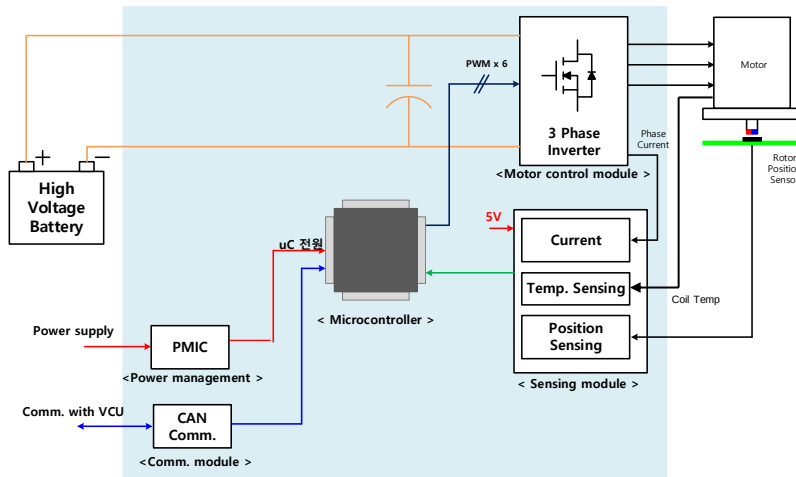
MCU External size

System voltage
72V, 100V



- Size(mm) : 234 x 193 x 65

Block Diagram



Specifications & Features

	Description	Specification	Remark
General	Operating Temp.	-20°C ~ 60°C	MCU ambient Temp.
	Storage Temp.	-20°C ~ 60°C	
	Cooling Method	Air cooled	
	IP Code	IP67	
Electrical	MCU Power	7.7kW	Max. Output Power ¹⁾
	Max. input voltage	120V	-
	Nominal drive Voltage range	50V ~ 120V	-
	Motor control	BLAC FOC ²⁾	Speed/Torque control
	PWM frequency	15kHz	-
	Communication	High speed CAN	500kbps Isolation CAN type

1) This value may change depending on system voltage

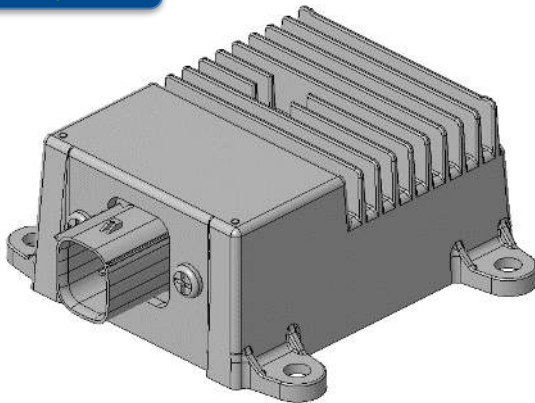
2) FOC : Field-Oriented Control (vector control)

- 32bit microcontroller applied
- PWM control for optimize efficiency
- High efficiency(>95%), Low loss
- BLAC FOC Control (Include Field Weakening Control)
- Regeneration control for constant torque
- Air cooling housing for heat control
- Diagnosis on Motor and MCU

10. IN-WHEEL MOTOR 3kW (3.0~5.4kW) : DC-DC CONVERTER <-WONTS

□ DC-DC External size & Features

System voltage
48V, 60V, 72V



- Size(mm) : 72 x 62 x 36

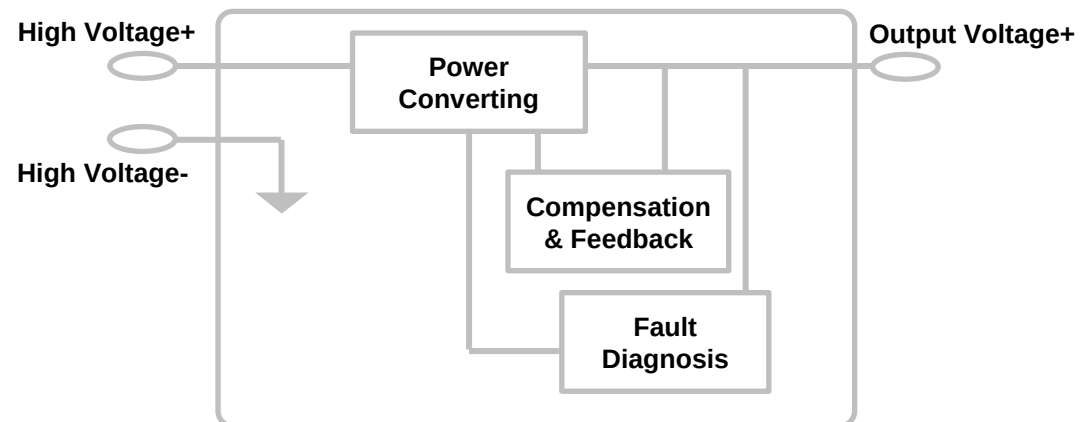
※ Excluding connector and assembly mount. Size can be change.

- EMI/EMC compliant
- Thermal protection for over temperature
- Output Over voltage and Over current protection
- Air cooling housing design to optimize radiant performance

□ Specifications

Description		Specification
General	Isolation	Non isolated
	Operating Temp.	-20°C ~ 85°C
	De-rating Operating Temp.	60°C ~ 85°C (50% of Full load)
	Capacity	150W
	IP code	IP67
Electrical	Input voltage range	40 ~ 84V
	Output voltage	14 Vdc
	Max. output current	10.7 A

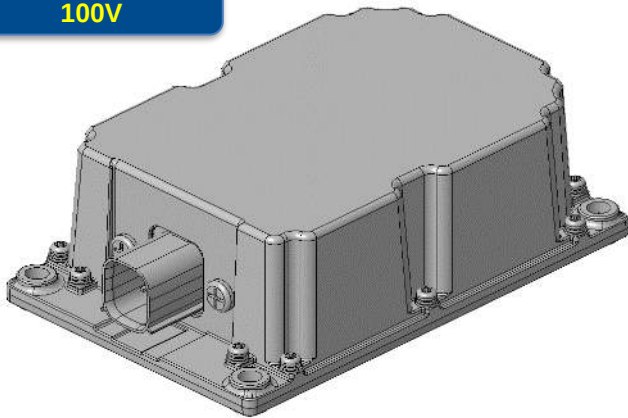
□ Block Diagram



10. IN-WHEEL MOTOR 3kW (3.0~5.4kW) : DC-DC CONVERTER <-WONTS

□ DC-DC External size & Features

System voltage
100V



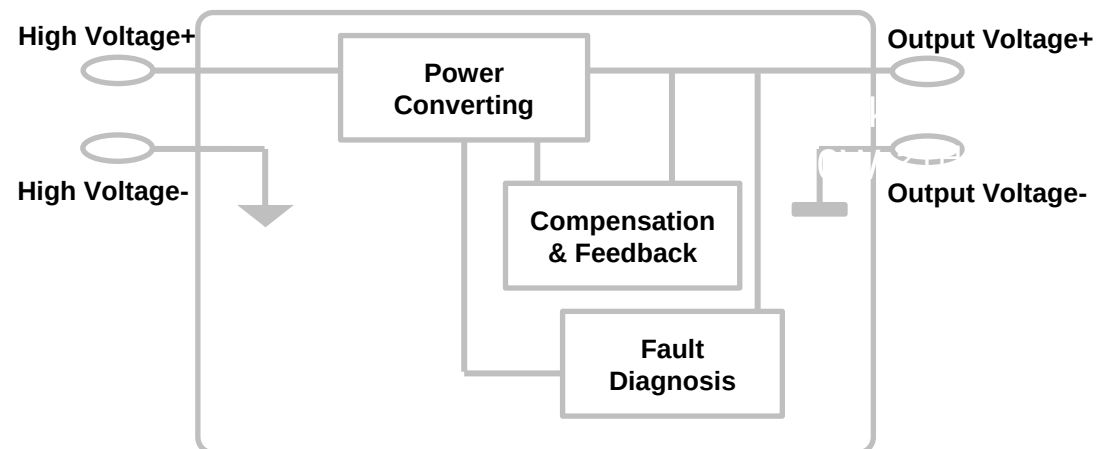
- Size(mm) : 100 x 155 x 50

- EMI/EMC compliant
- Thermal protection for over temperature
- Output Short circuit protection
- Output Over voltage and Over current protection
- Air cooling housing design to optimize radiant performance

□ Specifications

Description		Specification
General	Isolation	Isolated
	Operating Temp.	-20°C ~ 60°C
	De-rating Operating Temp.	60°C ~ 85°C (50% of Full load)
	Capacity	200W
	IP code	IP67
Electrical	Input voltage range	80 ~ 120V
	Output voltage	14 Vdc
	Max. output current	14.3 A

□ Block Diagram

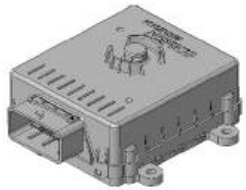


10.

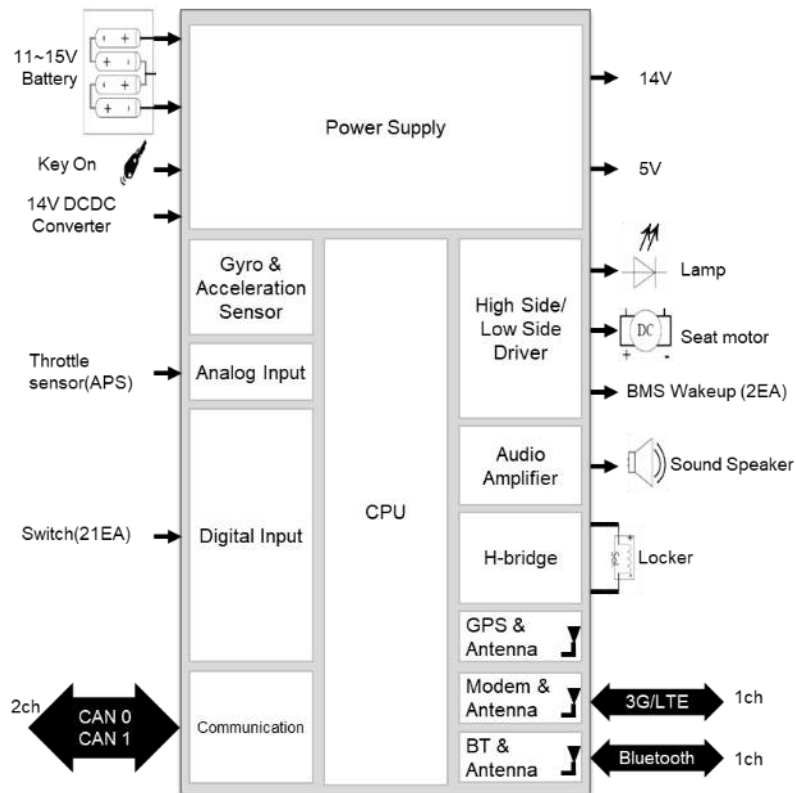
IN-WHEEL MOTOR 3kW (3.0~5.4kW) : VCU



VCU External size & Block diagram



- Size(mm) : 156 x 147 x 55



Specifications & Features

Description		Specification	Remark
General	Operating Temp.	-20°C ~ 60°C	VCU ambient Temp.
	Storage Temp.	-20°C ~ 60°C	
	IP Code	IP56	-
	Operating voltage	Typ. 14(11 ~ 15V)	-
Electrical	Input signal	Analog/Digital Switches, Sensors	-
	Output signal	Seat Motor, Solenoid, Relay, Speaker, Lamp	High/Low side Driver, Audio Amplifier, H-bridge
	Output voltage	14V / 5V	MCU, Sensor
	Communication	High Speed CAN (2-channel)	reserve(CAN0), MCU, BMS, CLU (CAN1)
		Bluetooth	Smart components
		GPS	Vehicle location service
		Modem	LTE Cat.1

- 32bit microcontroller applied
- Voltage regulator for sensor and other components.
- Operation control via encrypted key-fob, smart device identification
- Torque control according to throttle sensor with battery status (voltage, current, temp.), motor and MCU status.
- Lamp, Actuator control (High side x 4, Low side x 4, H-bridge, motor)
- Sound generator (12 WAV, Artificial driving sound, button sound)
- Monitors and detects system faults
- Customer-configurable mode and limp-home drive supported

11. IN-LINE MOTOR 5kW (6.8kW)



Main Specification

Product	Specification	
Motor	Type	PMSM (Inline geared)
	Cooling	Air Cooling
	Max. Power	6.8kW
	Max. Torque	30Nm
MCU	Cooling	Air Cooling
	Drive Type	3 Phase Inverter (FOC)
VCU	Hardware	Multi-I/O, Communications (CAN, BLE5.0, 3G/LTE)
	Software	Model-based Control
	Functions	Torque-based control Vehicle diagnostic monitoring Wireless communication
DC/DC Converter	Input Voltage	84V ~ 116V
	Output Voltage	14V
System Voltage (Battery)	Weight	9.9kg(1ea)
	Voltage	51.8/101.6V, 30Ah
	Capacity	Min 1.38kWh × 2 (Total 2.75kWh) Typical : 1.42kWh Minimum : 1.38kWh
	Type	Lithium-ION (21700)
BMS	Cell Balancing	Passive

Performance Expectation



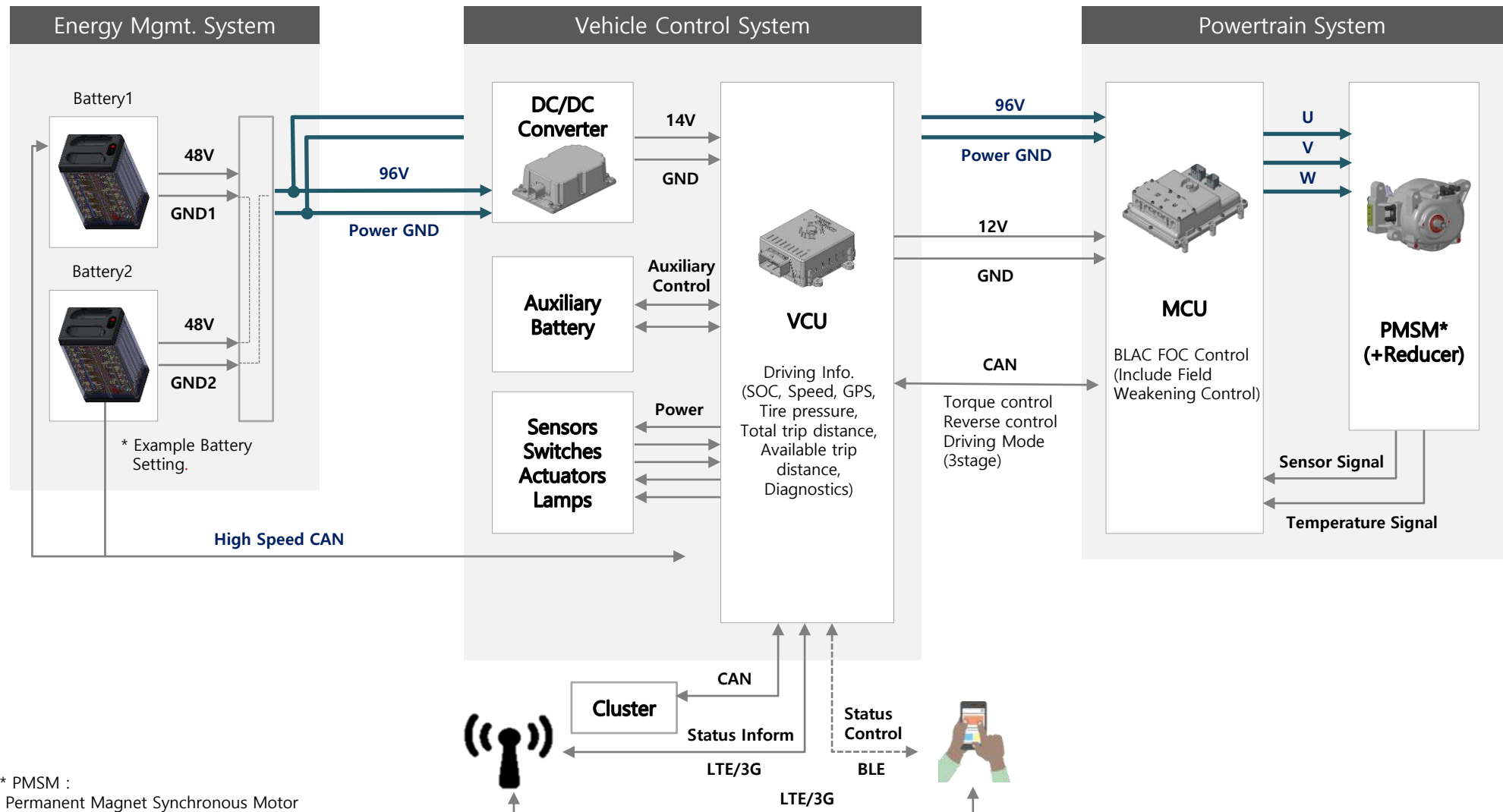
Description		Specification
System Performance	Max Power [kW]	6.8 kW
	Max Torque [Nm]	30 Nm
	Rated Power [kW] (ECE R85, 30 Min Net Power)	4.7 kW
	Rated Torque [Nm] (ECE R85, 30 Min Net Power)	12.8 Nm
	IP code	IP67
Test Result ¹⁾ (Kefico Dynamo)	Max Speed	90.6 Km/h
	Acceleration 0-50 *	4.4 Sec
	Hill Climb (5km/h) *	56.4 %
	Energy Efficiency (CV540, 2% incline)	38.38 Wh/Km
	Battery	48V 30Ah *2ea (Series Connect 96V 30Ah)

¹⁾ Test Condition

- Weight Condition : 190kg [120kg(empty) + 75kg(1 Person)]
- Gear Ratio : 7 : 1 [Chain : 15/35, Motor RGR : 3:1]
- Tire Size : 12 Inch

11. IN-LINE MOTOR 5kW (6.8kW)

System Management Diagram



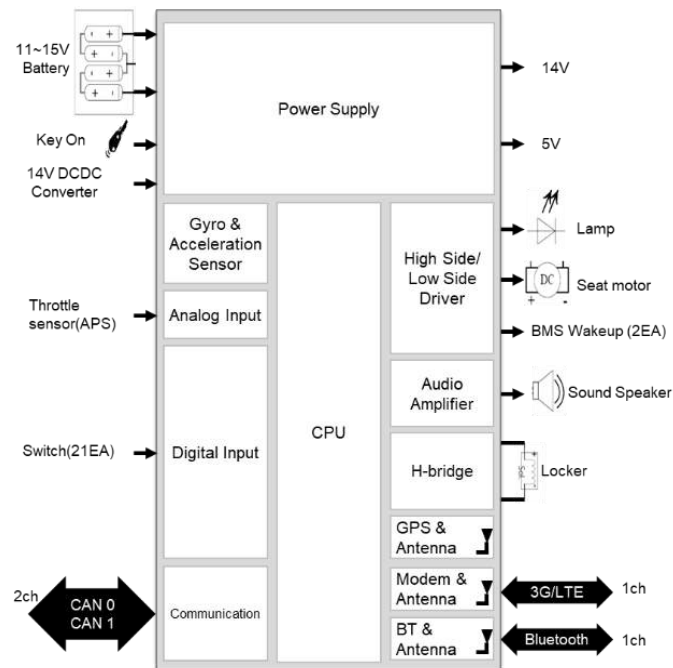
11. IN-LINE MOTOR 5kW (6.8kW) : VCU

VCU (Vehicle Control Unit)

External size
: 156 x 147 x 55mm



Block diagram



Specifications & Features

Description	Specification	Remark
Operating Temp.	-20°C ~ 60°C	VCU ambient Temp.
Storage Temp.	-20°C ~ 60°C	
IP Code	IP56	-
Operating voltage	Typ. 14(11 ~ 15V)	-
Input signal	Analog/Digital Switches, Sensors	-
Output signal	Seat Motor, Solenoid, Relay, Speaker, Lamp	High/Low side Driver, Audio Amplifier, H-bridge
Output voltage	14V / 5V	MCU, Sensor
Communication	High Speed CAN (2-channel)	reserve(CAN0), MCU, BMS, CLU (CAN1)
	Bluetooth	Smart components
	GPS	Vehicle location service
	Modem	LTE Cat.1

- 32bit microcontroller applied
- Voltage regulator for sensor and other components.
- Operation control via encrypted key-fob, smart device identification
- Torque control according to throttle sensor with battery status (voltage, current, temp.), motor and MCU status.
- Lamp, Actuator control (High side x 4, Low side x 4, H-bridge, motor)
- Sound generator (12 WAV, Artificial driving sound, button sound)
- Monitors and detects system faults
- Customer-configurable mode and limp-home drive supported

11.

IN-LINE MOTOR 5kW (6.8kW) : VCU FUNCTION



3,829 customizable code

Diagnosis code : 2,532 | Malfunction code : 130



VCU Function

01. Driving Control

Control torque/RPM based on driver's will and the condition of each module

02. Vehicle Monitoring

Monitoring speed, location, odometer, Motor cycle turn-over (G-sensor)

03. Diagnostic Management

Total 130 malfunction code and active-intervention according to the condition of vehicle

04. Data Service

Communication with Key-fob, Smart-phone application and Cloud server by 3G/LTE and Bluetooth

05. Actuator Control

Control accessories (Lamp, Seat, Alarm cluster, battery cover etc.)

06. Vehicle Operation

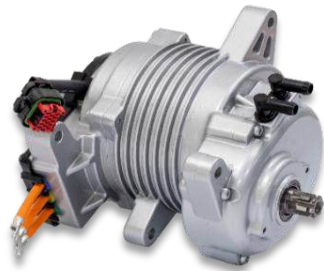
Handling the system from sleep, wake-up to Start mode

11.

IN-LINE MOTOR 5kW (6.8kW) : MOTOR

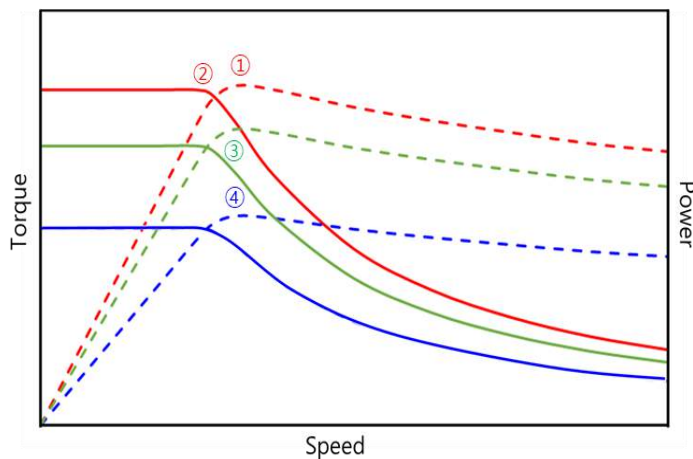
Motor

External size
: 154 x 214 x 231mm



Features

- ① PMSM : Permanent magnet synchronous motor
- ② IPM : Interior permanent magnet
- ③ Max. value within operating time
- ④ ECE R85, 30min Net Power



Specifications

Description	Specification
Operating Temp.	-20°C ~ 60°C
Storage Temp.	-20°C ~ 60°C
Motor Type	PMSM1) (3 Phase IPM2) type)
Cooling Method	Air cooling
Position Sensor	Angular position sensor
IP code	IP67
System Voltage Nominal	100V
① Max. Power ³⁾	6.8 kW (3.5min, 85Adc @ 2,500rpm)
② Max. Torque ³⁾	30 Nm (3.5min @ 2,000rpm)
③ Power ⁴⁾ (30min)	4.7 kW (@ 3,500rpm)
Torque ⁴⁾ (30min)	12.8 Nm (@ 3,500rpm)
④ Power (continuous)	3.4 kW (@ 3,500rpm)
Torque (continuous)	9.3 Nm (@ 3,500rpm)
Gear Ratio of Reducer	3:1

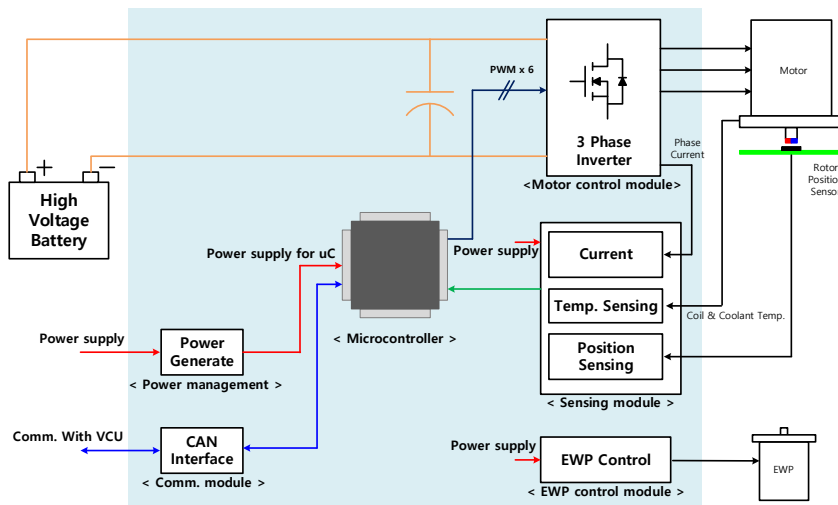
11. IN-LINE MOTOR 5kW (6.8kW) : MCU

MCU (Motor Control Unit)

External size
: 234 x 211 x 68mm



Block diagram



Specifications & Features

Description	Specification	Remark
Operating Temp.	-20°C ~ 60°C	MCU ambient Temp.
Storage Temp.	-20°C ~ 60°C	
Cooling Method	Air cooled	-
IP Code	IP67	-
MCU Power	7.7kW	Max. Output Power1)
Max. input voltage	120V	-
Nominal voltage	101V	-
Nominal drive Voltage range	50V ~ 120V	-
Motor control	BLAC FOC ²⁾	Speed/Torque control
PWM frequency	15kHz	-
Communication	High speed CAN	500kbps Isolation CAN type

- 32bit microcontroller applied
- PWM control for optimize efficiency
- High efficiency(>95%), Low loss
- BLAC FOC Control (Include Field Weakening Control)
- Regeneration control for constant current
- Cooling Pin for heat control – Air cooling
- Diagnosis on motor, MCU and cooling System

11.

IN-LINE MOTOR 5kW (6.8kW) : DC-DC CONVERTER

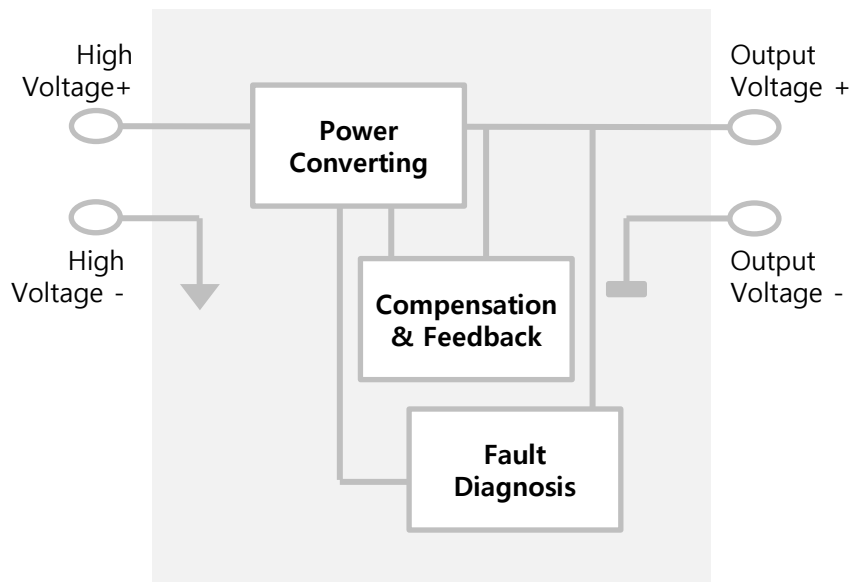


DC-DC Converter

External size
: 100 x 155 x 50mm



Block diagram



Specifications & Features

Description		Specification
General	Isolation	Isolated
	Operating Temp.	-20°C ~ 60°C
	De-rating Operating Temp.	60°C ~ 85°C (50% of Full load)
	Capacity	200W
	IP code	IP67
Electrical	Input voltage range	80 ~ 120V
	Output voltage	14 Vdc
	Max. output current	14.3 A

- EMI/EMC compliant
- Thermal protection for over temperature
- Output Short circuit protection
- Output Over voltage and Over current protection
- Air cooling housing design to optimize radiant performance

12. IN-LINE MOTOR 7kW (7.2kW)



Main Specification

Product		Specification	
Motor		Type	PMSM (Inline geared)
		Cooling	Water Cooling
		Max. Power	7.2kW
		Max. Torque	35Nm (0-2000rpm)
MCU		Cooling	Water Cooling
		Drive Type	3 Phase Inverter (FOC)
VCU		Functions	Multi-I/O, Communications (CAN, BLE5.0, 3G/LTE)
DC/DC Converter		Input Voltage	84V ~ 116V
		Output Voltage	14V(Converted to 12V via VCU)
Cooling System	EWP	Type	2 phase BLDC / IP67
		Voltage	9~16.5V
	Radiator	-	Tube & Fin type
	Reservoir	Volume	400~500 cc
		Hose	I.D / O.D : Φ9 / Φ13.8
System Voltage (Battery)		Weight	9.9kg(1ea)
		Voltage	51.8/101.6V, 30Ah
		Capacity	Min 1.38kWh × 2 (Total 2.75kWh) Typical : 1.42kWh Minimum : 1.38kWh
		Type	Lithium-ION (21700)
BMS		Cell Balancing	Passive

Performance Expectation



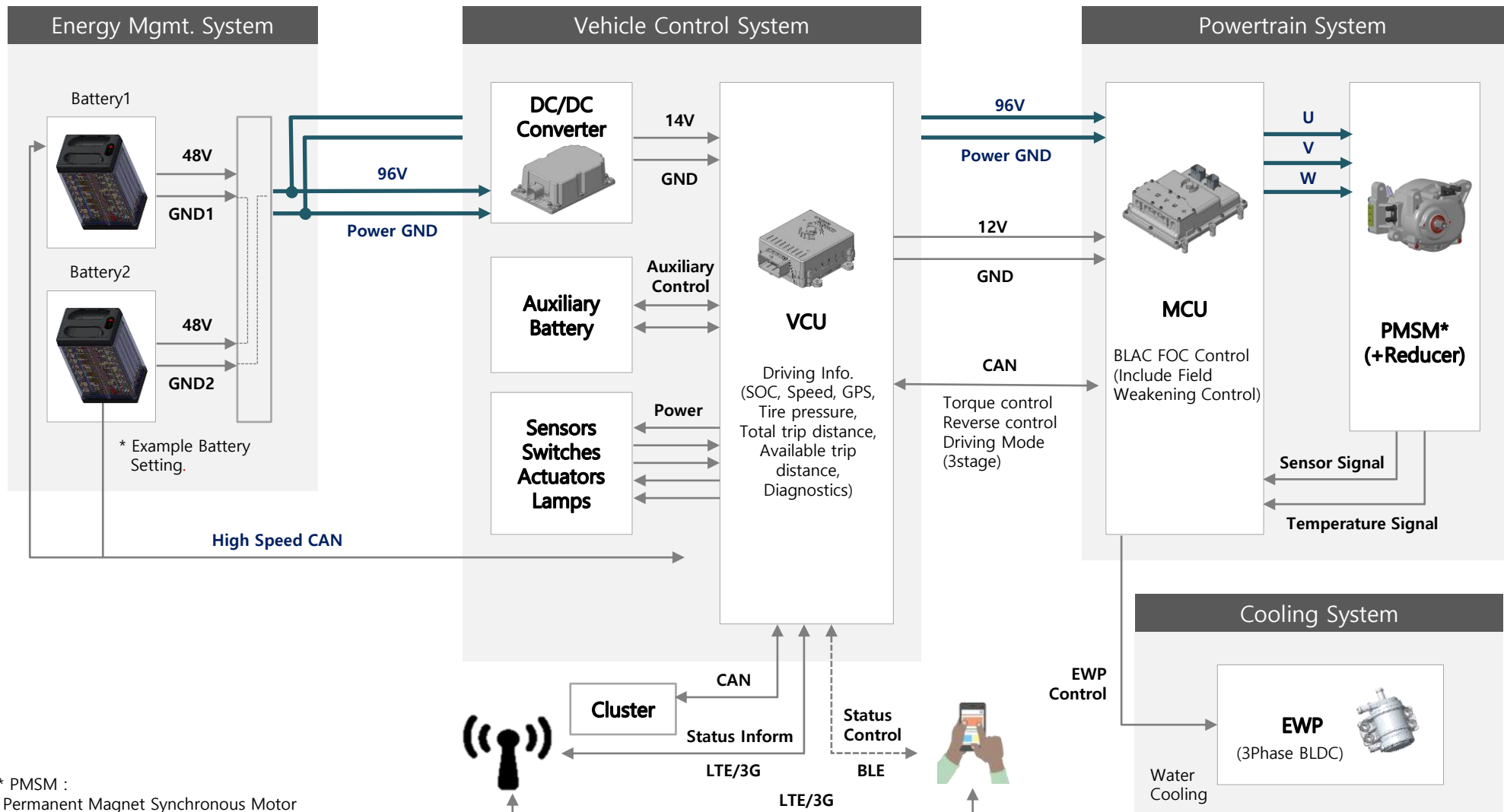
Description		Specification
System Performance	Max Power [kW]	7.2 kW
	Max Torque [Nm]	35 Nm
	Rated Power [kW] (ECE R85, 30 Min Net Power)	6.3 kW
	Rated Torque [Nm] (ECE R85, 30 Min Net Power)	24 Nm
	IP code	IP67
Test Result ¹⁾ (Kefico Dynamo)	Max Speed	90.6 Km/h
	Acceleration 0-50 *	4.2 Sec
	Hill Climb (5km/h) *	70.8 %
	Energy Efficiency * (CVS 40, 2% Incline)	41.999 Wh/Km (=23.81km/kWh)
	Battery	48V 30Ah *2ea (Series Connect 96V 30Ah)

¹⁾ Test Condition

- Weight Condition : 195kg [120kg(empty) + 75kg(1 Person)]
- Gear Ratio : 7.928 [Chain : 14/37, Motor RGR : 3:1]
- Tire Size : 13 Inch [130/60-13]

12. IN-LINE MOTOR 7kW (7.2kW)

System Management Diagram



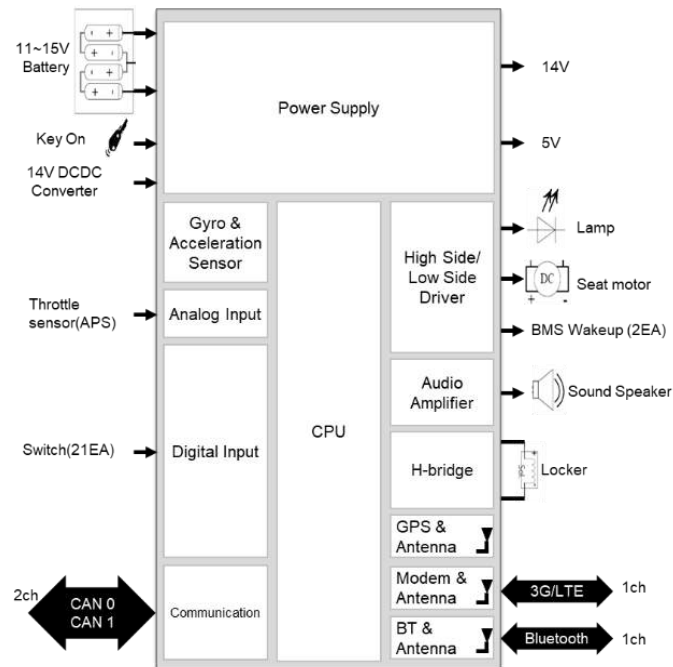
12. IN-LINE MOTOR 7kW (7.2kW) : VCU

VCU (Vehicle Control Unit)

External size
: 156 x 147 x 55mm



Block diagram



Specifications & Features

Description	Specification	Remark
Operating Temp.	-20°C ~ 60°C	VCU ambient Temp.
Storage Temp.	-20°C ~ 60°C	
IP Code	IP56	-
Operating voltage	Typ. 14(11 ~ 15V)	-
Input signal	Analog/Digital Switches, Sensors	-
Output signal	Seat Motor, Solenoid, Relay, Speaker, Lamp	High/Low side Driver, Audio Amplifier, H-bridge
Output voltage	14V / 5V	MCU, Sensor
Communication	High Speed CAN (2-channel)	reserve(CAN0), MCU, BMS, CLU (CAN1)
	Bluetooth	Smart components
	GPS	Vehicle location service
	Modem	LTE Cat.1

- 32bit microcontroller applied
- Voltage regulator for sensor and other components.
- Operation control via encrypted key-fob, smart device identification
- Torque control according to throttle sensor with battery status (voltage, current, temp.), motor and MCU status.
- Lamp, Actuator control (High side x 4, Low side x 4, H-bridge, motor)
- Sound generator (12 WAV, Artificial driving sound, button sound)
- Monitors and detects system faults
- Customer-configurable mode and limp-home drive supported

12.

IN-LINE MOTOR 7kW (7.2kW) : VCU FUNCTION



3,829 customizable code

Diagnosis code : 2,532 | Malfunction code : 130



VCU Function

01. Driving Control

Control torque/RPM based on driver's will and the condition of each module

02. Vehicle Monitoring

Monitoring speed, location, odometer, Motor cycle turn-over (G-sensor)

03. Diagnostic Management

Total 130 malfunction code and active-intervention according to the condition of vehicle

04. Data Service

Communication with Key-fob, Smart-phone application and Cloud server by 3G/LTE and Bluetooth

05. Actuator Control

Control accessories (Lamp, Seat, Alarm cluster, battery cover etc.)

06. Vehicle Operation

Handling the system from sleep, wake-up to Start mode

12. IN-LINE MOTOR 7kW (7.2kW) : MOTOR

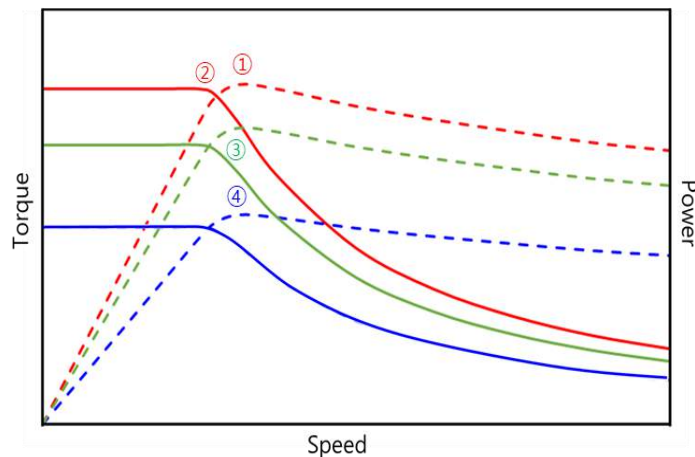
Motor

External size
: 165 x 176 x 200mm



Features

- ① PMSM : Permanent magnet synchronous motor
- ② IPM : Interior permanent magnet
- ③ Max. value within operating time
- ④ ECE R85, 30min Net Power



Specifications

Description		Specification	
Operating Temp.		-20°C ~ 60°C	
Storage Temp.		-20°C ~ 60°C	
Motor Type		PMSM1) (3 Phase IPM2) type)	
Cooling Method		Water cooling	
Position Sensor		Angular position sensor	
IP code		IP67	
System Voltage Nominal		72V	100V
①	Max. Power ³⁾	4.9 kW (2min, 90Adc @ 1,500rpm)	7.2 kW (3min, 90Adc @ 2,000rpm)
②	Max. Torque ³⁾	35 Nm (2min @ 1,000rpm)	35 Nm (3min @ 1,500rpm)
③	Power ⁴⁾ (30min)	4.3 kW (@ 1,500rpm)	6.3 kW (@ 2,500rpm)
	Torque ⁴⁾ (30min)	27.3 Nm (@ 1,500rpm)	24.0 Nm (@ 2,500rpm)
④	Power (continuous)	4.1 kW (@ 1,500rpm)	6.1 kW (@ 2,500rpm)
	Torque (continuous)	26.1 Nm (@ 1,500rpm)	23.3 Nm (@ 2,500rpm)
Gear Ratio of Reducer		3:1	

※ Cooling condition(power/torque test) : Water/Glycol Mix @ 60°C & 5lpm

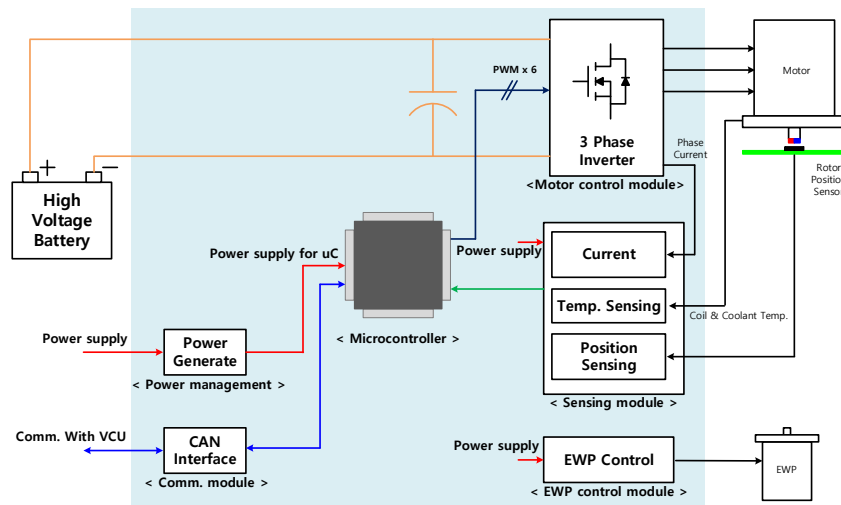
12. IN-LINE MOTOR 7kW (7.2kW) : MCU

MCU (Motor Control Unit)

External size
: 234 x 211 x 68mm



Block diagram



Specifications & Features

Description	Specification	Remark
Operating Temp.	-20°C ~ 60°C	MCU ambient Temp.
Storage Temp.	-20°C ~ 60°C	
Cooling Method	Water cooled	-
IP Code	IP67	-
MCU Power	7.7kW	Max. Output Power1)
Max. input voltage	120V	-
Nominal voltage	101V	-
Nominal drive Voltage range	50V ~ 120V	-
Motor control	BLAC FOC ²⁾	Speed/Torque control
PWM frequency	15kHz	-
Communication	High speed CAN	500kbps Isolation CAN type

- 32bit microcontroller applied
- PWM control for optimize efficiency
- High efficiency(>95%), Low loss
- BLAC FOC Control (Include Field Weakening Control)
- Regeneration control for constant current
- Water cooling housing for heat control
- Diagnosis on motor, MCU and cooling System

12.

IN-LINE MOTOR 7kW (7.2kW) : DC-DC CONVERTER

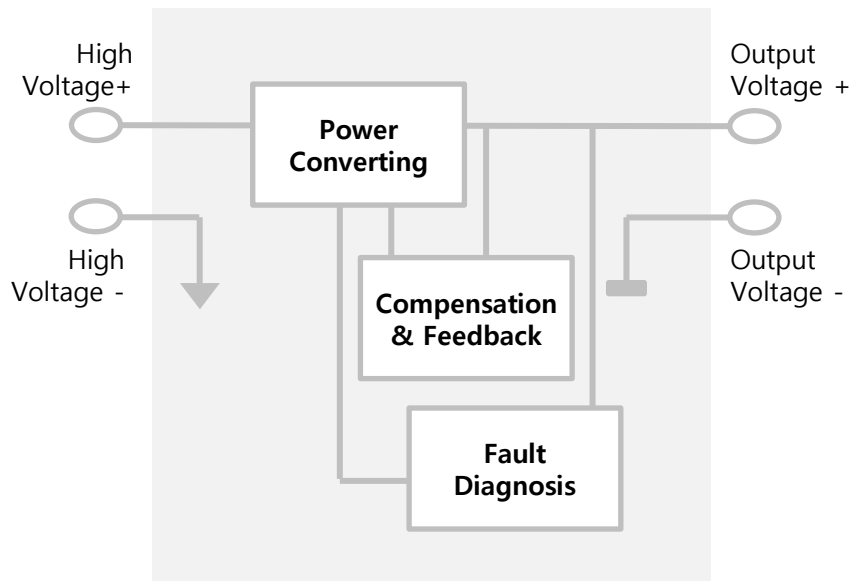


DC-DC Converter

External size
: 100 x 155 x 50mm



Block diagram



Specifications & Features

Description		Specification
General	Isolation	Isolated
	Operating Temp.	-20°C ~ 60°C
	De-rating Operating Temp.	60°C ~ 85°C (50% of Full load)
	Capacity	200W
	IP code	IP67
Electrical	Input voltage range	80 ~ 120V
	Output voltage	14 Vdc
	Max. output current	14.3 A

- EMI/EMC compliant
- Thermal protection for over temperature
- Output Short circuit protection
- Output Over voltage and Over current protection
- Air cooling housing design to optimize radiant performance

12.

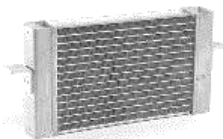
IN-LINE MOTOR 7kW (7.2kW) : COOLING MODULE



Cooling Module



EWP
: 86 x 60 x 92mm



Radiator
: 250 x 110 x 53mm

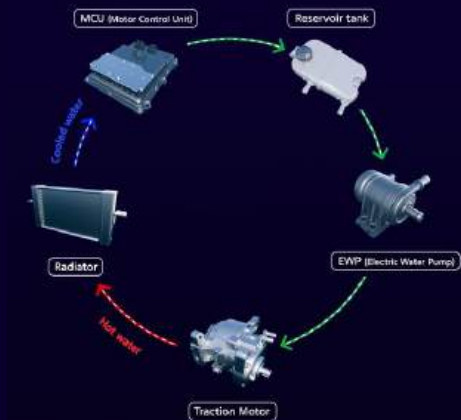


Reservoir Tank
: 133 x 190 x 60mm

Specifications & Features

Description		Specification
EWP	Operating Temp.	-20°C ~ 60°C
	Motor Type	3 phase BLDC
	Operating voltage	9 ~ 16.5V
	Flow rate	4.5 LPM @0.4 bar
	Rated input	20W
	IP code	IP67
Radiator	Type	Tube & Fin type
	Fin type	Louver Fin
Coolant Reservoir	Volume	370 cc

Concept



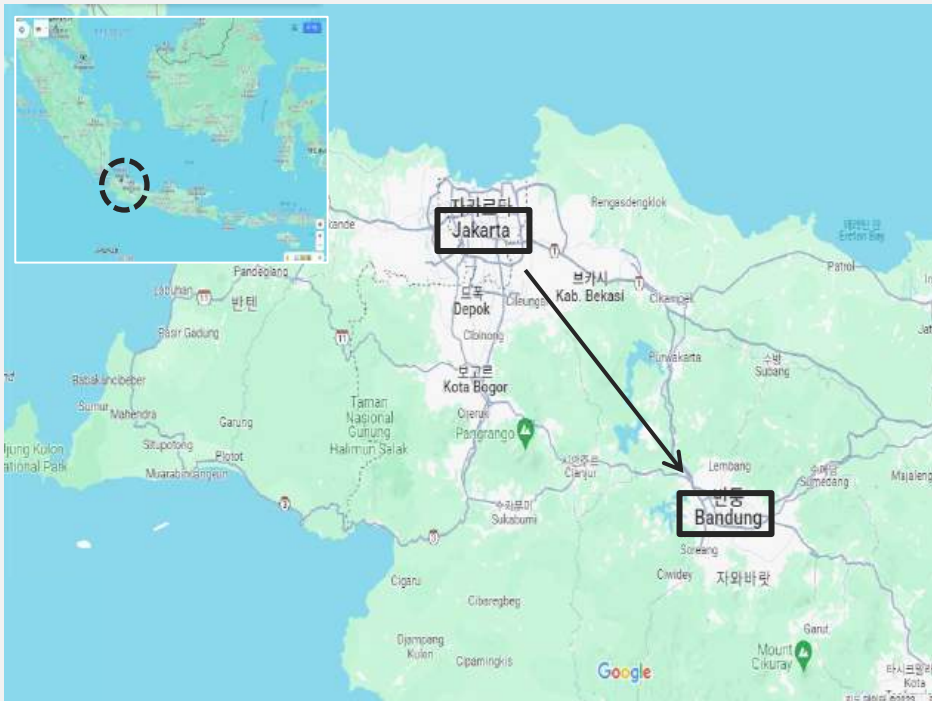
- To optimize design parameter for high cooling efficiency
 - EWP Impeller & Casing design
 - Radiator Tube size, Fin size
 - Structure design to prevent coolant leakage

13.

K-WONTS POWERTRAIN COMPARISON TEST RESULT



200km **Real Road** driving test
from Jakarta to Bandung



K-WONTS
Deux 7



6.8kW Peak Power
96V 30Ah Battery

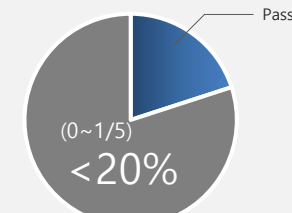
Arrival Rate



Indonesia A社
Model 'O'



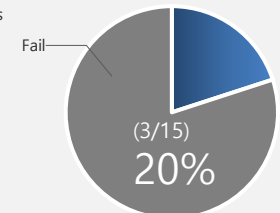
4kW **Rated** Power
60V 45Ah Battery



Indonesia G
Model 'G'



5.0kW Peak Power
72V 20Ah Battery

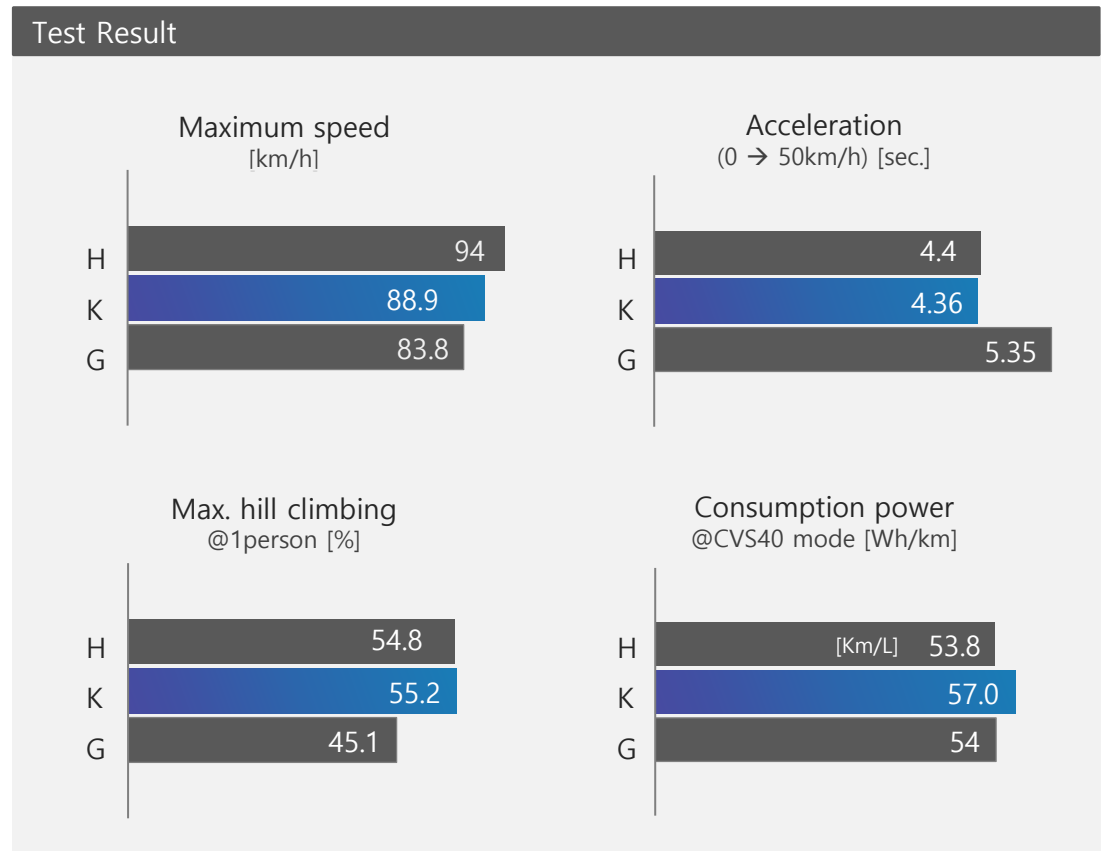


13.

K-WONTS POWERTRAIN COMPARISON TEST RESULT

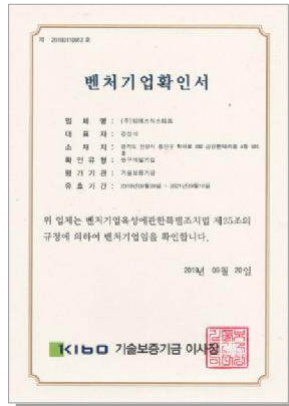


Test Vehicles			
	Global H Model 'P'	K-WONTS PT	Global G Model 'H'
			
Max. Power	8.9 kW (Engine)	6.8 kW (Motor)	6.4 kW (Motor)
Max. Torque	11.8 Nm	30 Nm	25 Nm
Energy (Fuel)	125CC	48V 30Ah *2ea (Series Connect 104V 30Ah)	43.2V 30Ah *2ea

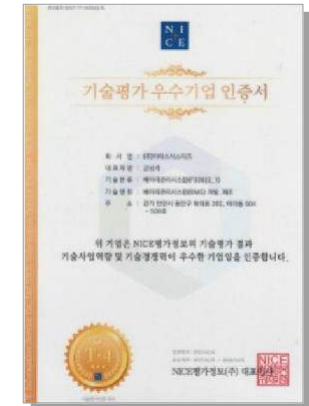
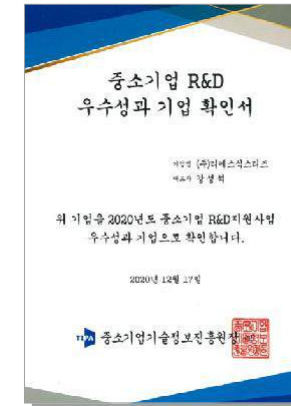
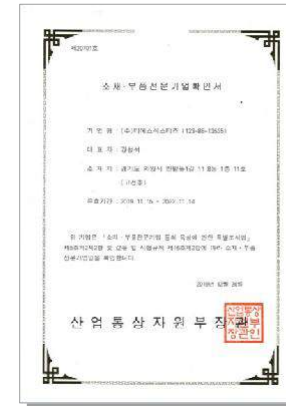


14. CERTIFICATIONS AND AWARDS

VENTURE / INNOBIZ



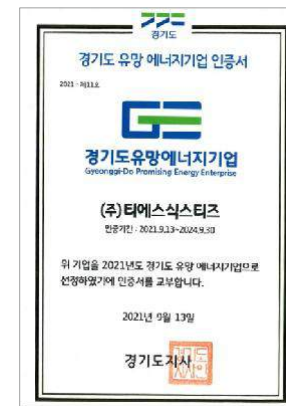
EXCELLENT TECHNICAL EVALUATION COMPANY



ISO9001 / ISO14001 / IATF16949



PROMISING ENERGY COMPANY / EXPORT AWARD





WHERE CUSTOMERS START THEIR JOURNEY FOR
BATTERY & POWER SOLUTIONS.

CONTACT POINT

HQ Address #505, Geumkang Pentarium IT Tower A, 282, Hagui-ro, Dongan-gu, Anyang, Gyeonggi, Republic of Korea, 14056

Tel. / Fax. +82-70-8282-7483 / +82-505-828-7490

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