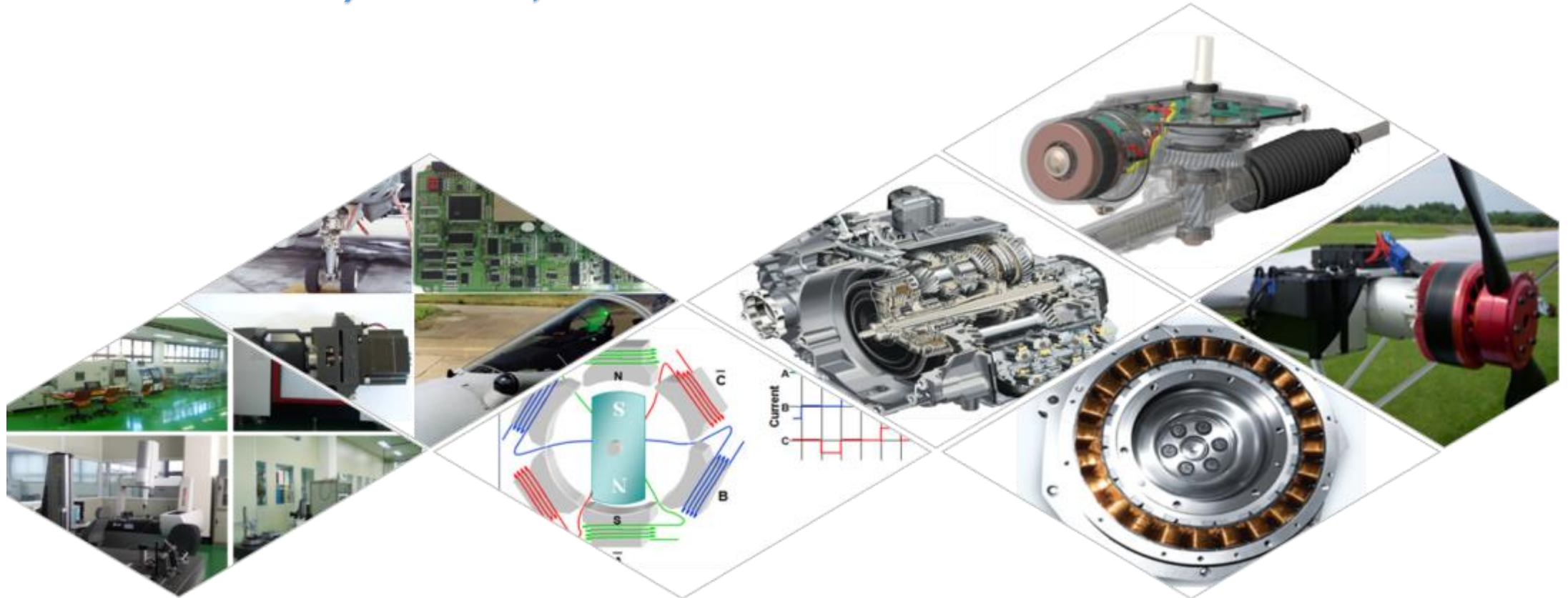


# Motion Provider **SAMHYUN**

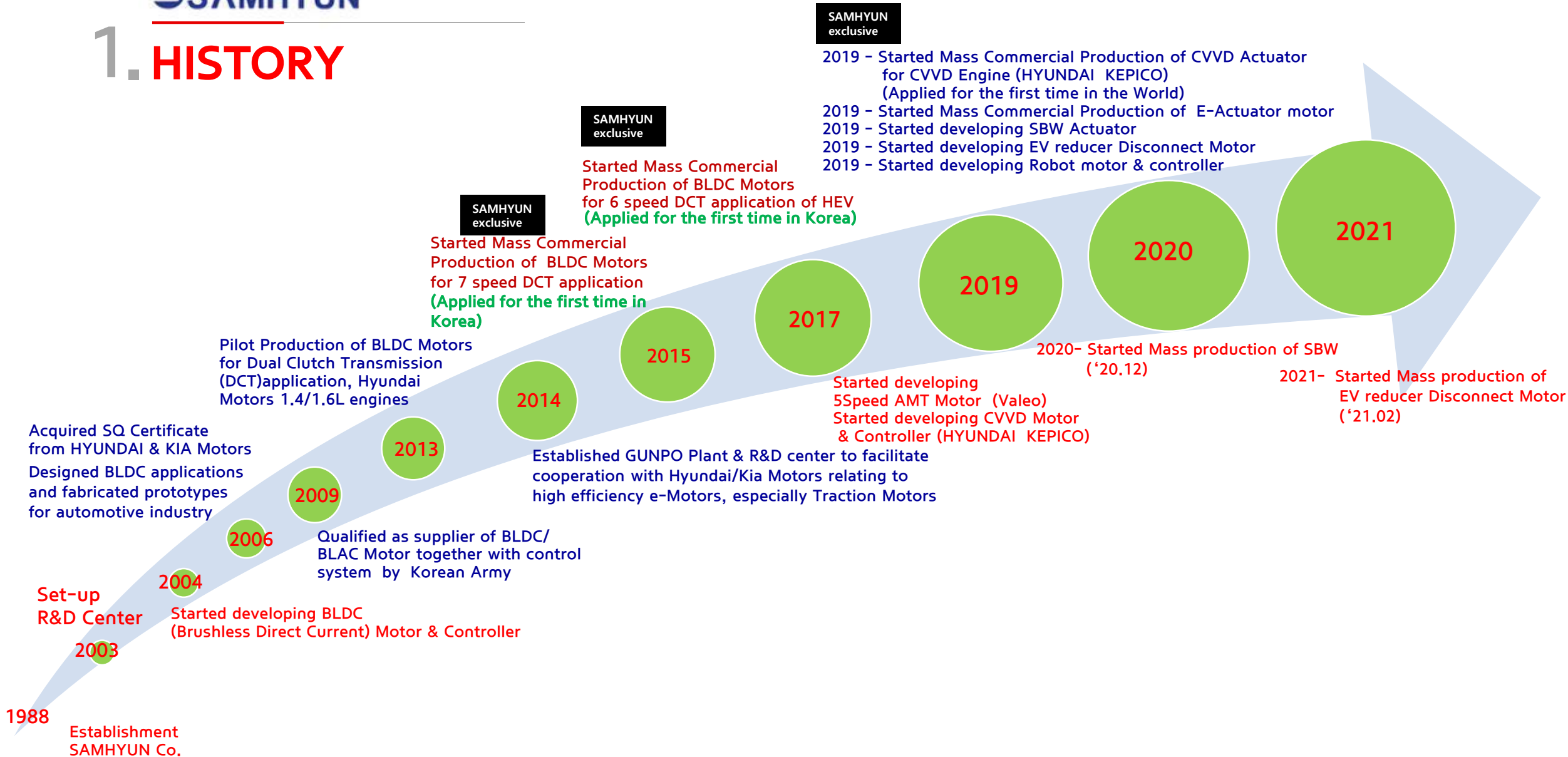
*-Every motion, we drive & control*



# CONTENTS

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3. ORGANIZATION	5
4. BUSINESS	6
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<b><i>APPENDIX. APPLICATIONS</i></b>	<b>14-31</b>

# 1. HISTORY



# 2. LOCATION



**1**

## CHANGWON PLANT & R&D Center

*- 30min.drive away from BUSAN*



- ✓ Head Quarters
- ✓ R & D Center : BLDC, BLAC, Controller
- ✓ Automated Production Line : BLDC, BLAC
  1. HKMC DCT Motor
    - Capability : 400,000ea/year x 4 lines = 1,600,000ea
  2. HKMC CVVD Actuator Motor
    - Capability : 400,000ea/year x 2 lines = 800,000ea
  3. SBW Actuator Motor
    - Capability : 780,000ea/year x 1 line = 780,000ea
- ✓ Customized R&D capability for Automotive & Defense.

**2**

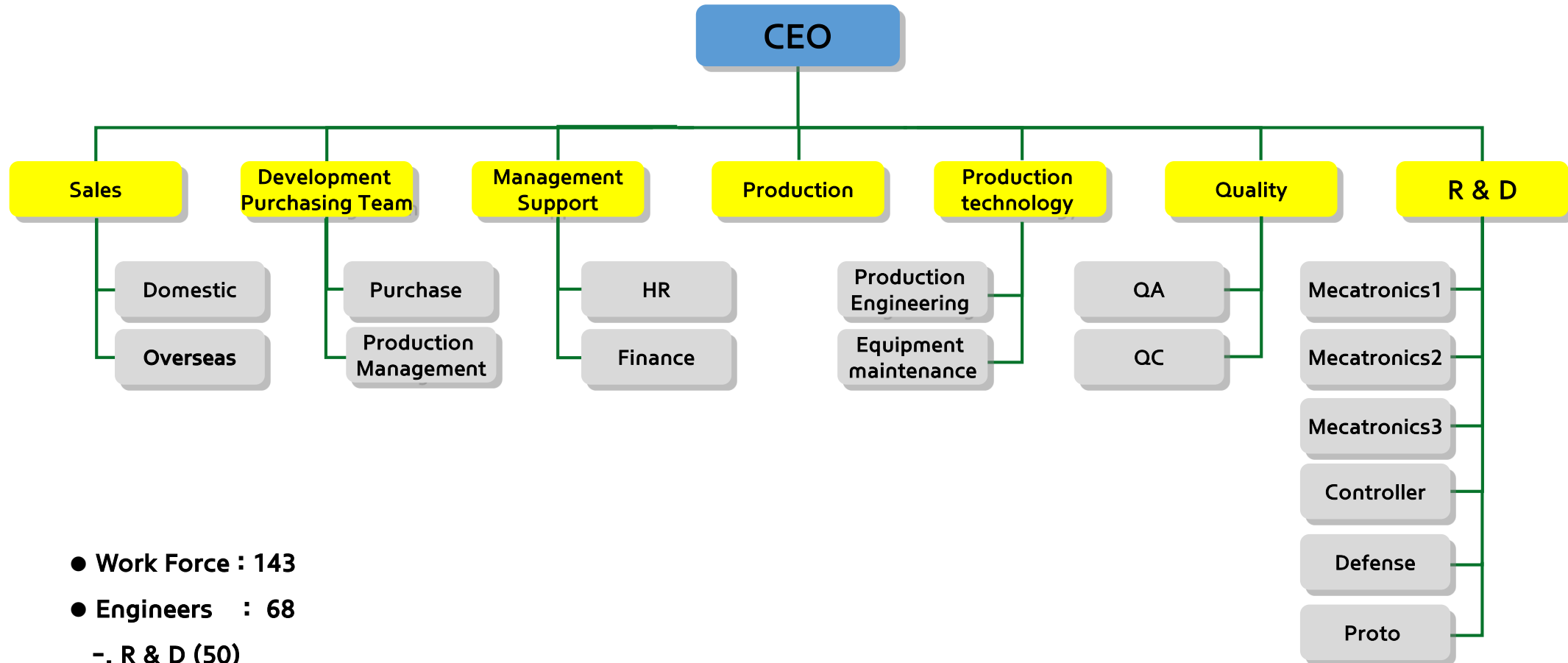
## Haman Plant

*- 50min.drive away from BUSAN*



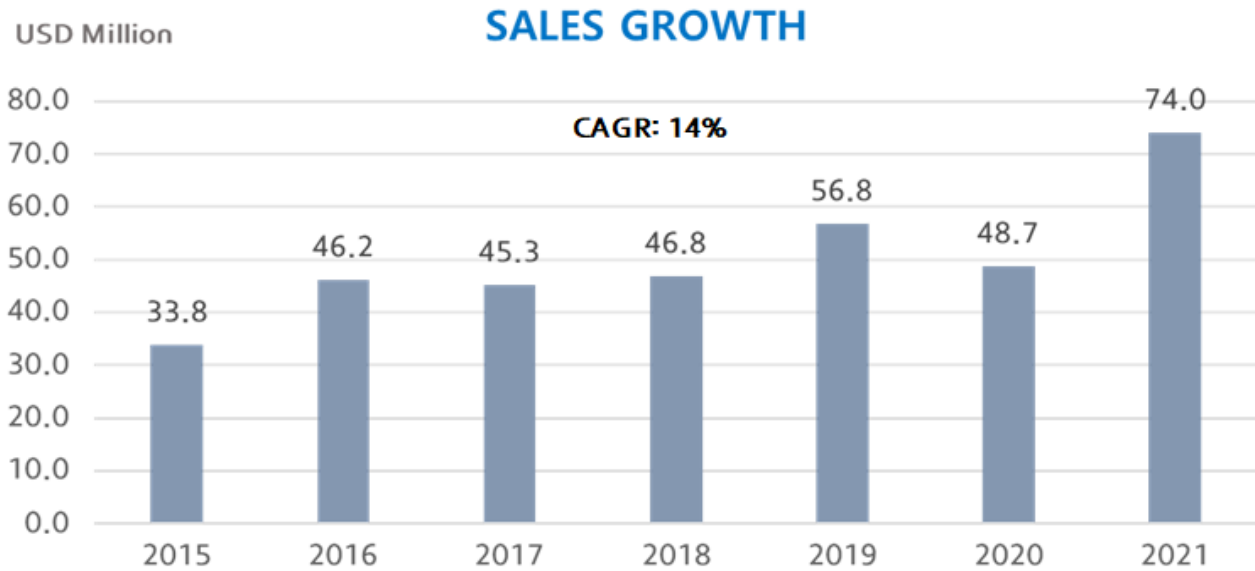
- ✓ Defense Industrial Motor and Actuators
- ✓ Traction Motor
- ✓ Industrial Motor and Actuators

# 3. ORGANIZATION

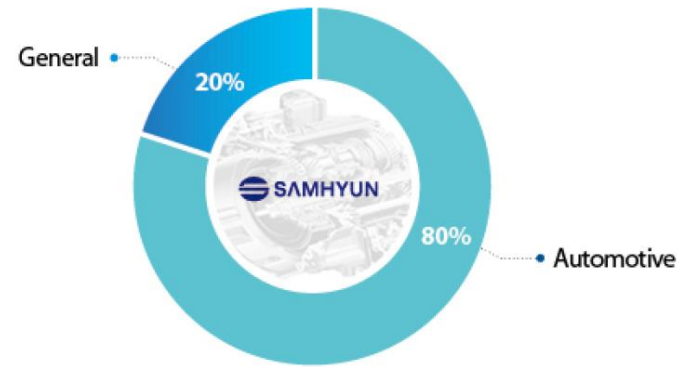


- Work Force : 143
- Engineers : 68
  - . R & D (50)
  - . QA & Production (18)

# 4. BUSINESS



### SALES PORTFOLIO



### MAJOR CUSTOMERS



# 5. CERTIFICATES

**bsi.**

Certificate of Registration

QUALITY MANAGEMENT SYSTEM - ISO/TS 16949:2009

This is to certify that:  
 Samhyun Co., Ltd.  
 21, Pyeongsan-ro Bsoon-gil  
 Uichang-gu, Changwon-si  
 Gyeongangnam-do  
 641-847  
 Republic of Korea

Holds Certificate No: **TS 93598**  
 and operates a Quality Management System which complies with the requirements of ISO/TS 16949:2009 for the following scope:

The manufacture of electronic sub-assembly parts such as brush holder  
 Permitted Exclusion: Product design.

For and on behalf of BSI:  
 Managing Director Korea, JaeHoon Han

Issue Date: 05/05/2014  
 Latest Issue: 05/05/2014  
 Exp: ...[M]



This certificate was issued electronically and remains the property of BSI and is bound by the conditions of certificate. An electronic certificate can be authorized [globe](#). Printed copies can be obtained at [www.bsigroup.com/bsi/customer-service](http://www.bsigroup.com/bsi/customer-service) or telephone +44 20 777 4123. Further details regarding the scope of this certificate and the applicability of ISO/TS 16949 requirements may be obtained from BSI Customer Services, 11111 Sunning Hill Road, Suite 200, Reston, VA 20190, USA. BSI Group Korea Limited, 217, Jungro Tower H&M, 51, Jongro-gu, Seoul, L110-799, Korea. A Member of the BSI Group of Companies.

**ISO14001**



By Royal Charter

**bsi.**

Certificate of Registration

ENVIRONMENTAL MANAGEMENT SYSTEM - ISO 14001:2004

This is to certify that:  
 Samhyun Co., Ltd.  
 21, Pyeongsan-ro Bsoon-gil  
 Uichang-gu, Changwon-si  
 Gyeongangnam-do  
 641-847  
 Republic of Korea

Holds Certificate No: **EMS 544009**  
 and operates an Environmental Management System which complies with the requirements of ISO 14001:2004 for the following scope:

The design and manufacture of motors, The manufacture of electronic sub-assembly parts such as brush holder assemblies,

For and on behalf of BSI:  
 Gary Fenton, Global Assurance Director

Originally registered: 22/01/2009  
 Latest Issue: 25/02/2014  
 Expiry Date: 24/02/2017



Page: 1 of 1

...making excellence a habit™

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**IATF 16949**



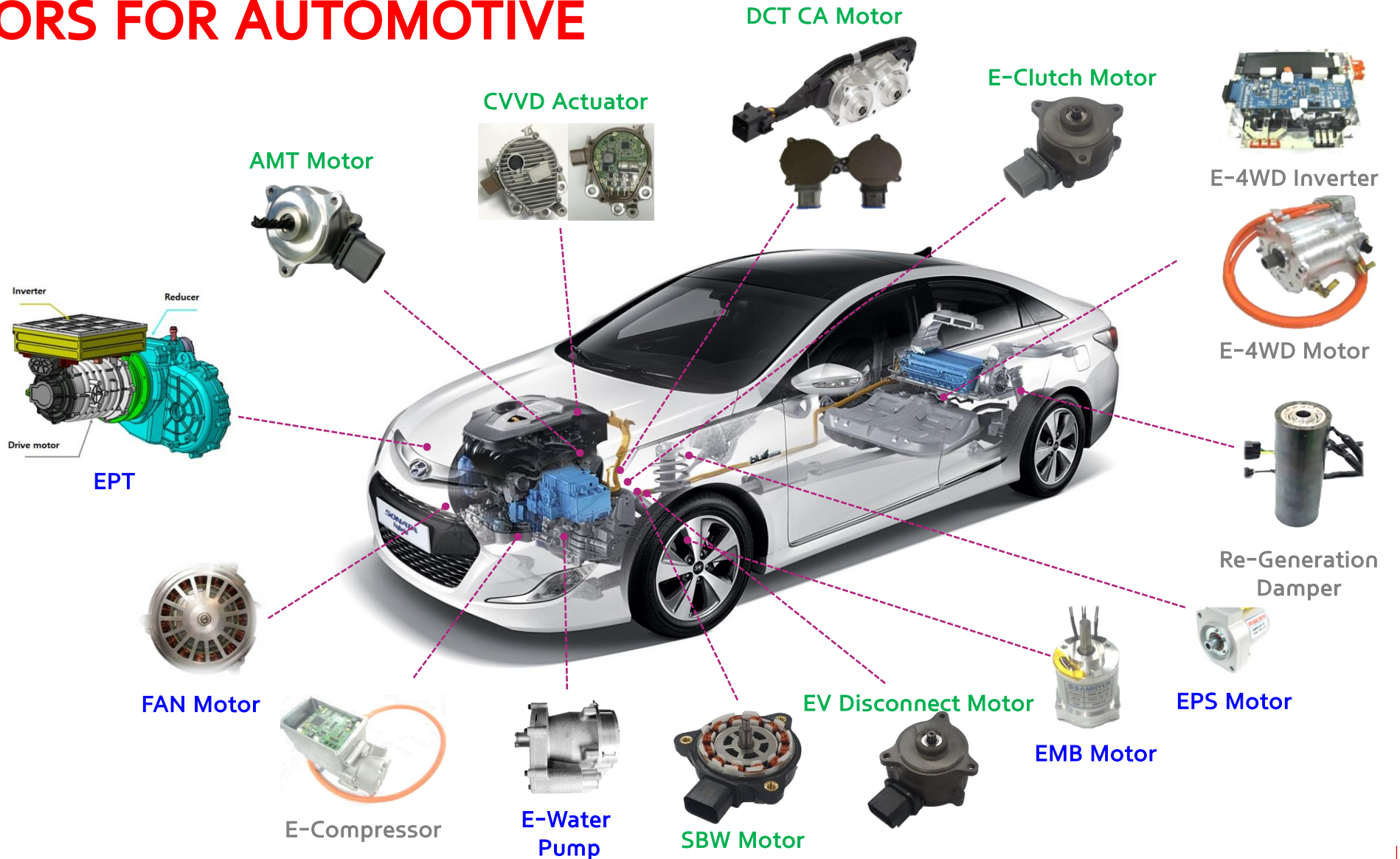
**SQ FROM HYUNDAI/KIA MOTORS (ELECTRIC/ELECTRONIC/WELD)**

**PATENT REGISTER : 18  
 PATENT APPLICATION : 15**



# 6. E-MOTORS FOR AUTOMOTIVE

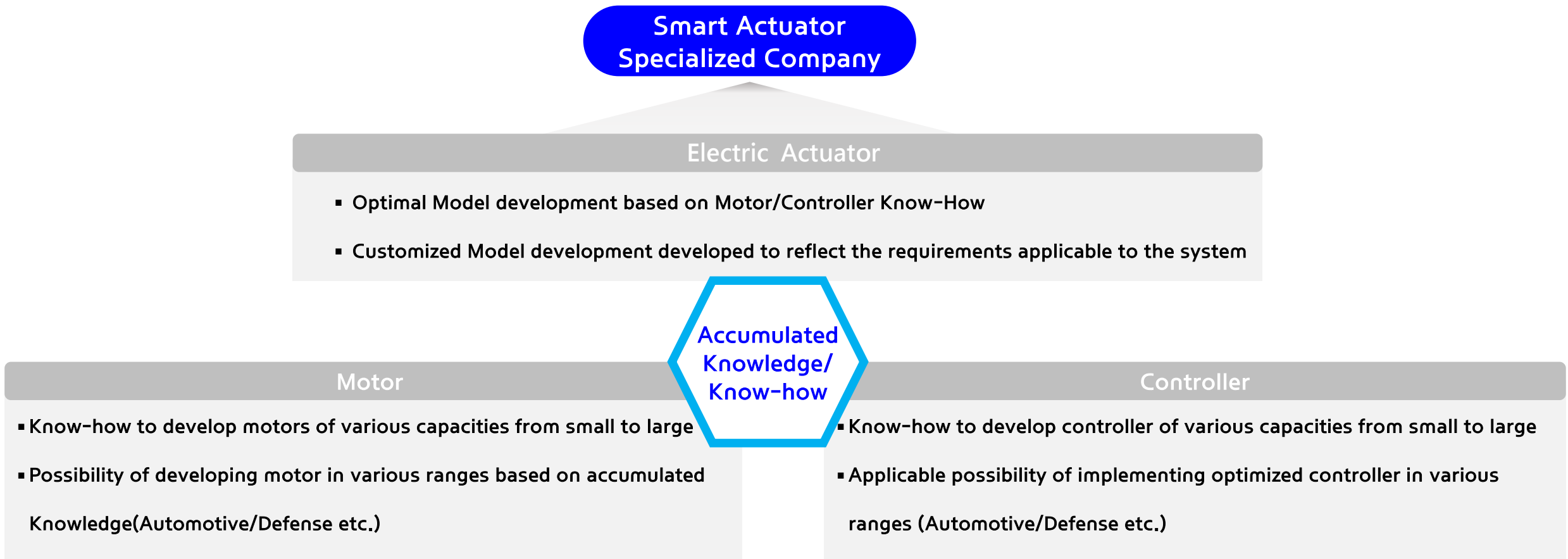
- Mass Production
- Proto Built-up, Rolled-Out
- Proto Designed, Built-up





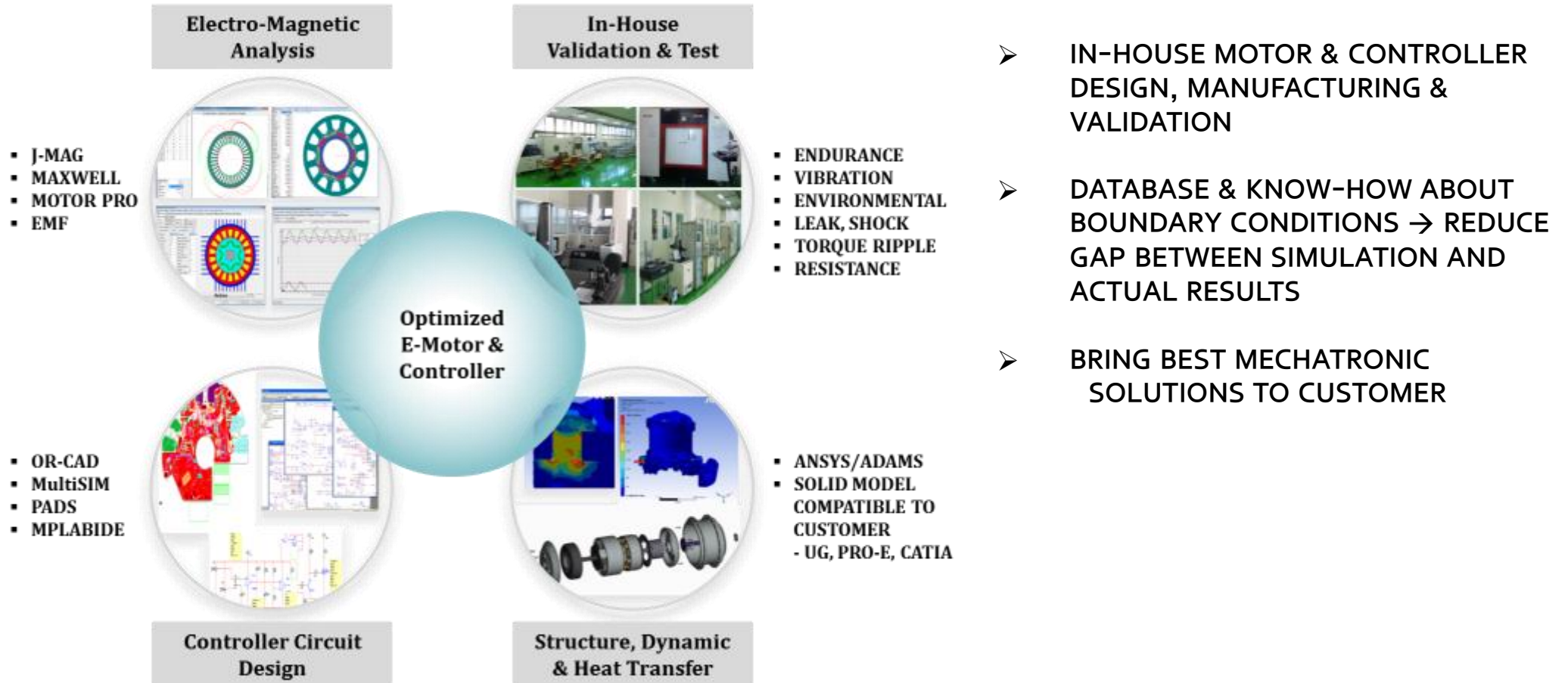
# 7. CORE COMPETENCY

- ✓ Realization of Optimized development
  - Based on Accumulated Motor/Controller Know-How on Accumulated Knowledge and plentiful experience.



# 7. CORE COMPETENCY

✓ *Superb, Proven solution in house R&D facilities and infrastructure*



# 7. CORE COMPETENCY

✓ **FLEXIBLE FROM NICHE VOLUME TO MASS PRODUCTION**

**NICHE VOLUME COST EFFECTIVELY FABRICATED BY IN-HOUSE EXPERTISES**

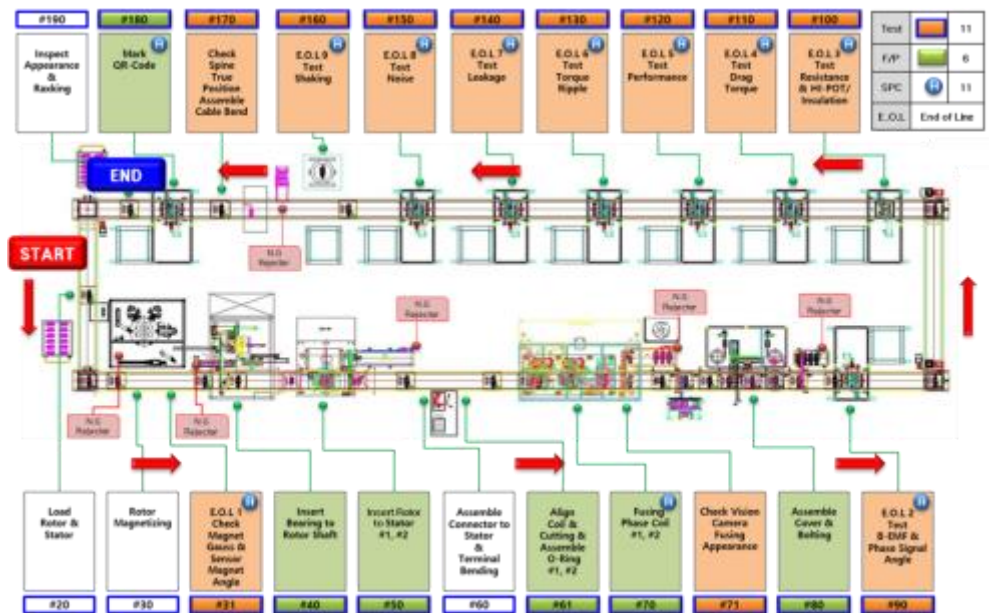
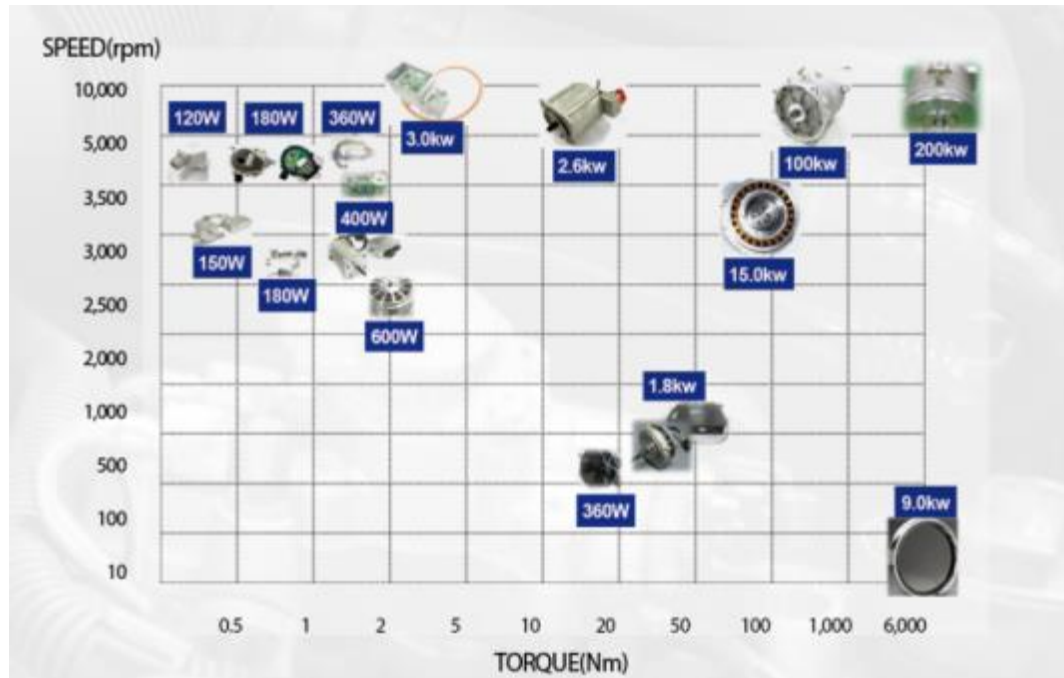
- Flexible to various ranges of Niche Volume, customized Applications such as Defense Industry etc

**-Mass Media-**

- <http://news.kbs.co.kr/news/view.do?ncd=4094876>
- [http://www.ktv.go.kr/content/view?content\\_id=571500](http://www.ktv.go.kr/content/view?content_id=571500)
- <https://www.youtube.com/watch?v=aPT6LaqtRUU&t=36s>

**MOST MODERN MACHINERY WITH HIGH LEVEL OF AUTOMATION**

- Fool Proof Processes, QR Code traceability, In-Line Inspection and SPC
- Clean Room



# 8. “CLOSE TO CUSTOMER”

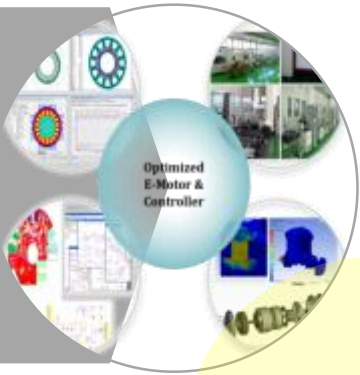
- ✓ MANUFACTURING, PACKING, ECONOMICAL LOGISTICS & SAFETY STOCK NEAR TO CUSTOMER SITE IS OUR GOAL AT ALL TIMES.
- ✓ HIGHLY RESPONSIVE SUPPLY AT A COST EFFECTIVE VALUE



# 9. WHAT SAMHYUN'S ADVANTAGE AND STRENGTH

**STRONG ENGINEERING ABILITY**

- ENGINEERS MORE THAN 40%
- SPEND R&D COSTS OF APPROX. 4.7% FROM ANNUAL SALES
- THE ONLY APPROVED BLDC/BLAC MOTOR WITH CONTROLLER BY KOREAN ARMY



**PROVEN TECHNOLOGY & PRODUCT RELIABILITY THROUGH BLDC MOTOR MASS PRODUCTION TO HYUNDAI MOTORS**

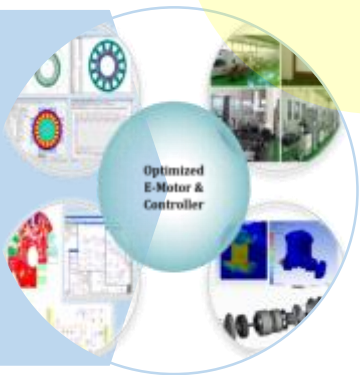
- 1.5 Million Motors / Annual



**WIN-WIN STRATEGY**

**MEDIUM SIZED BUT HIDDEN CHAMPION, FINANCIALLY SOUND & CONTINUOUSLY GROWING , ALWAYS DEDICATED TO CUSTOMERS**

- Innovation and Creativeness



**READY TO COLLABORATE WITH CUSTOMER IN TECHNICAL OR EVEN CAPITAL WISE**

- JV, JOINT RESEARCH CENTER
- WAREHOUSING NEAR TO CUSTOMER SITE BASED ON LONG TERM CONTRACT



# AUTOMOTIVE APPLICATIONS

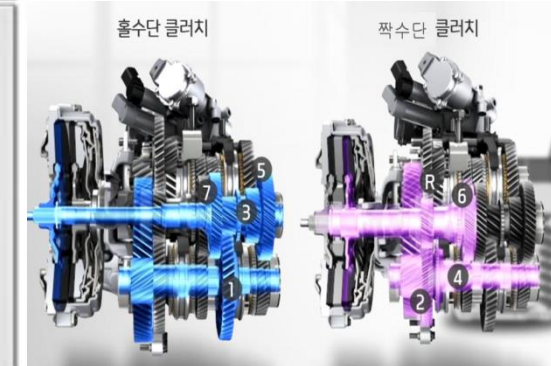
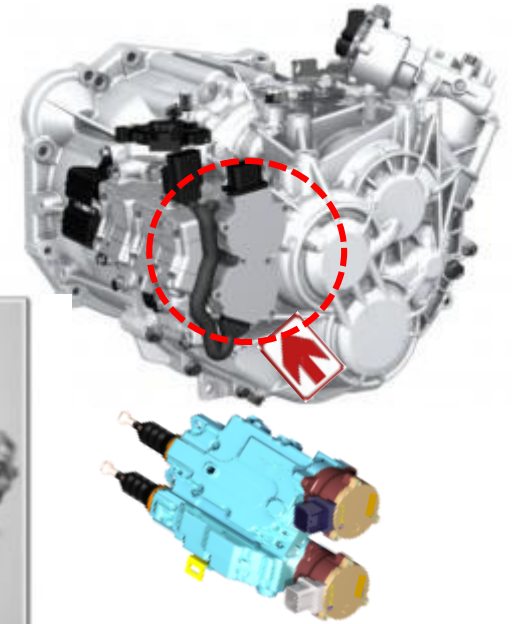
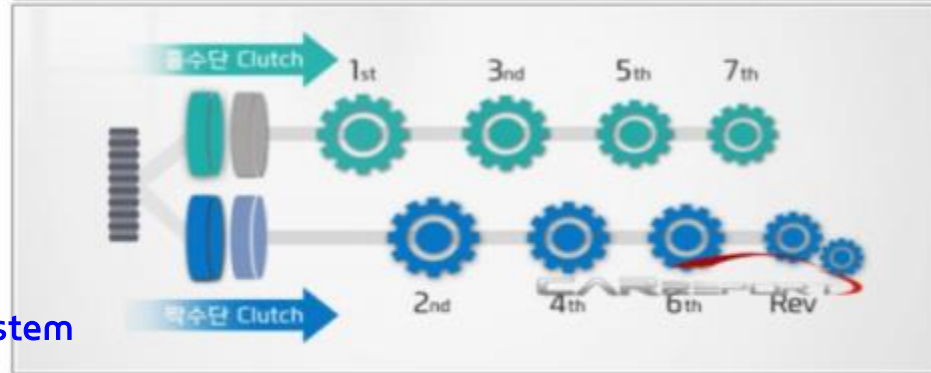
# APPENDIX. AUTOMOTIVE – DCT MOTORS

**7 SPEED DCT**

**6 SPEED HEV DCT**



**SAMHYUN  
exclusive**

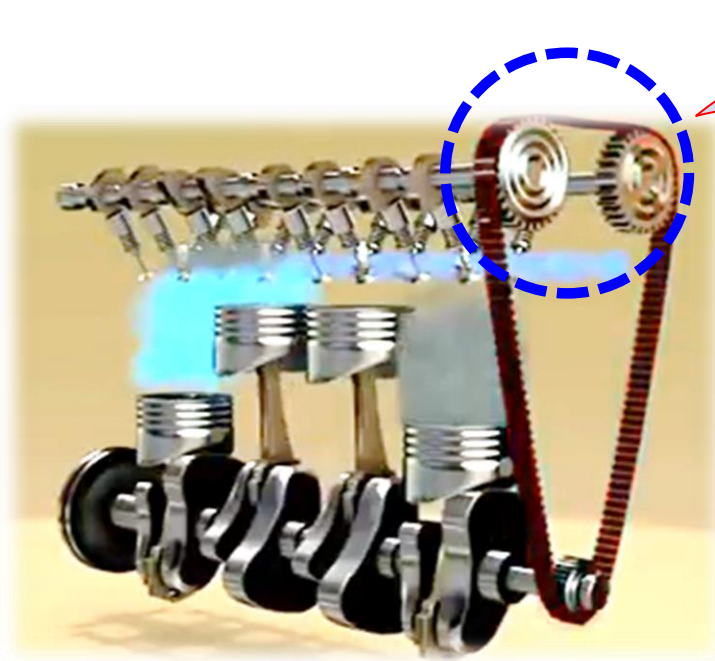
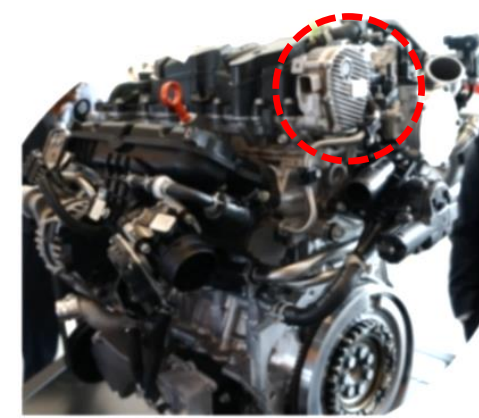


- Application : 7S DCT & 6S DCT Clutch Actuator
- Function: Power transmission to the clutch actuator system
- Applied 27 vehicles types.

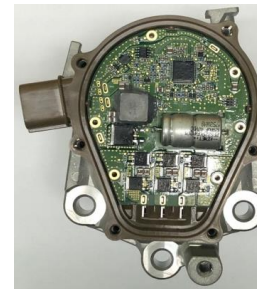


<https://www.youtube.com/watch?v=V120PfzszL0>

# APPENDIX. AUTOMOTIVE – CVVD Actuator (Continuous Variable Valve Duration)



Innovation



SAMHYUN  
exclusive

Previous

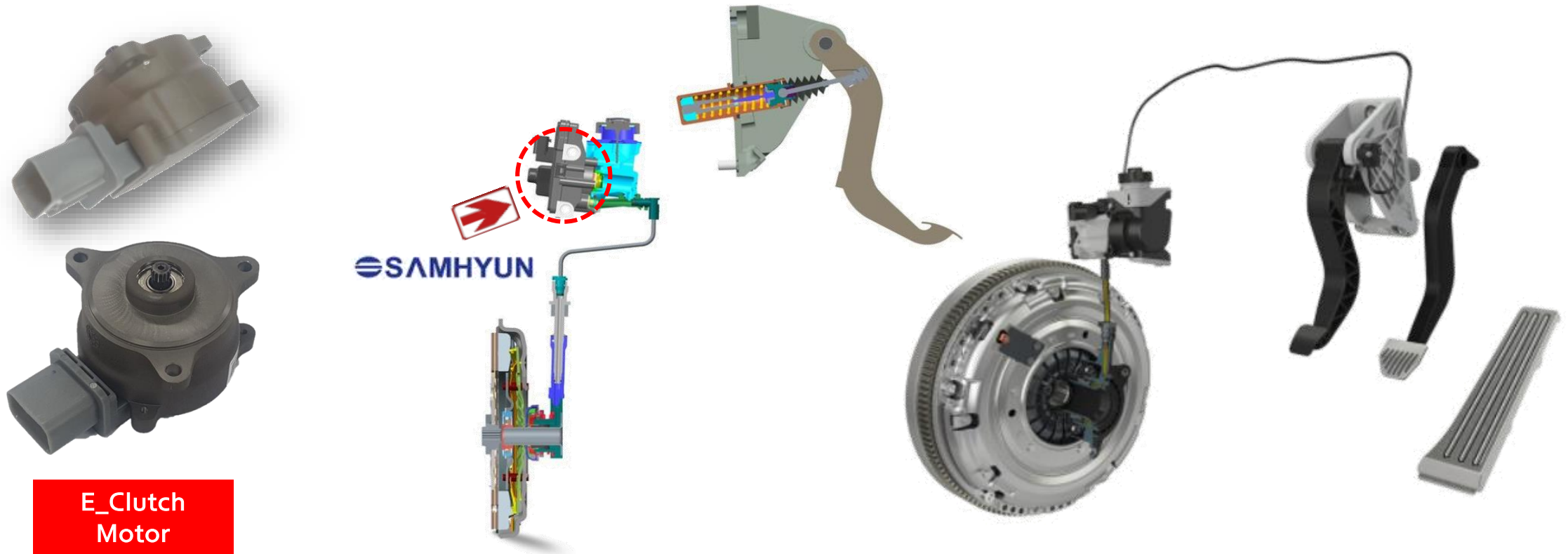
CVVD

- It was developed for the first time in the world by Hyundai. (CVVD Actuator :SAMHYUN)
- CVVD technology is that optimized the duration of opening and closing the valve according to the vehicle speed.
- Maximizing the gasoline combustion rate and improving the performance and fuel efficiency of the engine at the same time

<https://www.youtube.com/watch?v=5atYksEpAm8>



# APPENDIX. AUTOMOTIVE – E\_Clutch Motor



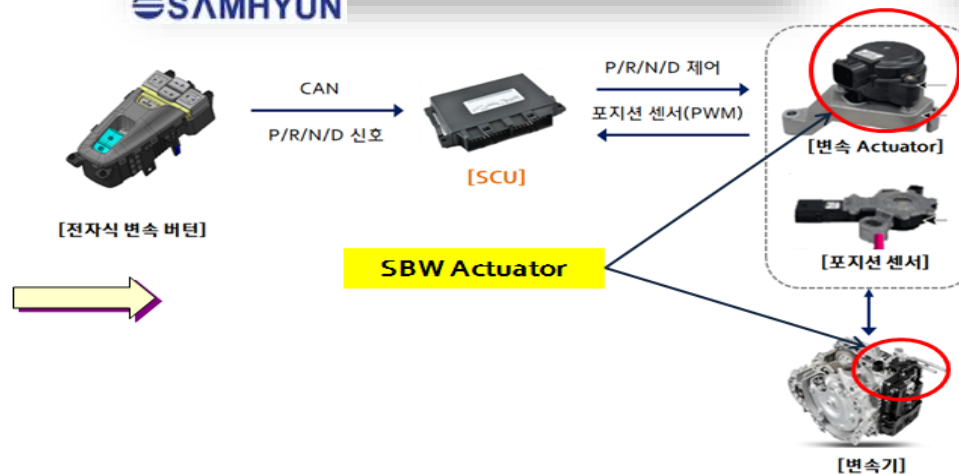
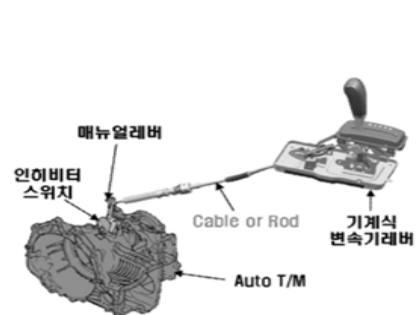
E\_Clutch Motor

In general and hybrid vehicles , this clutch can be installed in the manual transmission, Since the hydraulic system is not used, the vehicle price is reduced. The 1st and 2nd gears are available for transmission without stepping on the clutch, so they are the same as automatic transmissions in the case of repeated cycles. In urban areas, fuel efficiency is 10% better on average.

# APPENDIX. AUTOMOTIVE – Shift By Wire Actuator



Shift By Wire Actuator



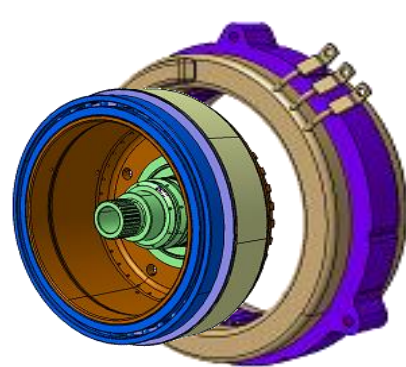
SBW's advantage is that there is no shock and vibration and no shape restriction by removing mechanical connection between transmission and transmission lever.

In addition, it gives a luxurious image and it also returns to the center even after changing the position of the lever.

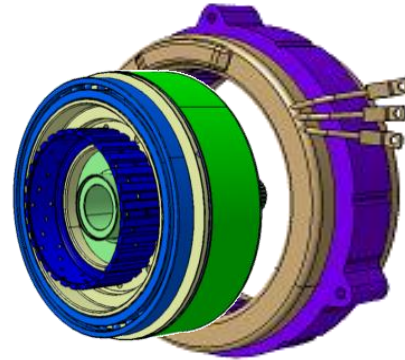
# AUTOMOTIVE – TRACTION MOTOR



➤ Power: 15[KW]



➤ Max. Power: 39[KW]

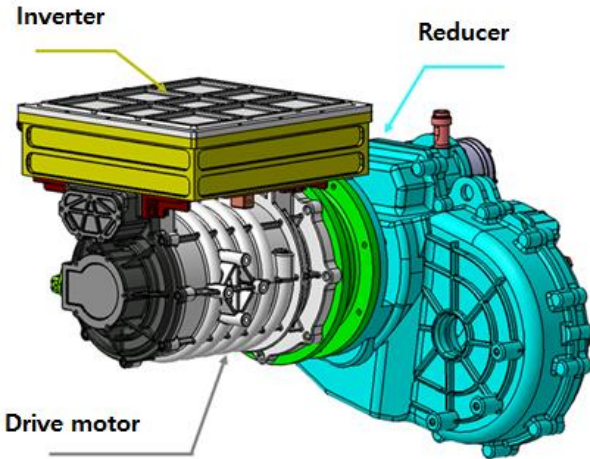


➤ Max. Power: 39[KW]



➤ Max. Power : 31 [kW]

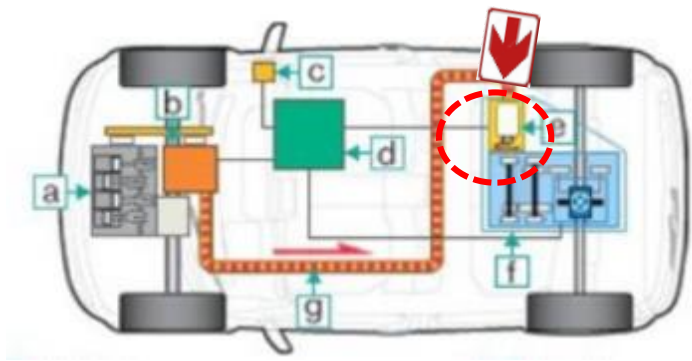
# APPENDIX AUTOMOTIVE – E-Power Train



- Maximum power: 150kW
- Reference voltage: 650Vdc
- Drive motor
  - Power density: 2.5kW/kg
  - Max torque: 360Nm
  - Max speed: 12,000rpm
  - Hairpin type stator
- inverter
  - SiC MOSFET applied, High Power Density
  - Motor torque control accuracy: within  $\pm 2.5\%$
  - EMC : HMC O ver.



# APPENDIX. AUTOMOTIVE – 4WD MOTOR/CONTROLLER



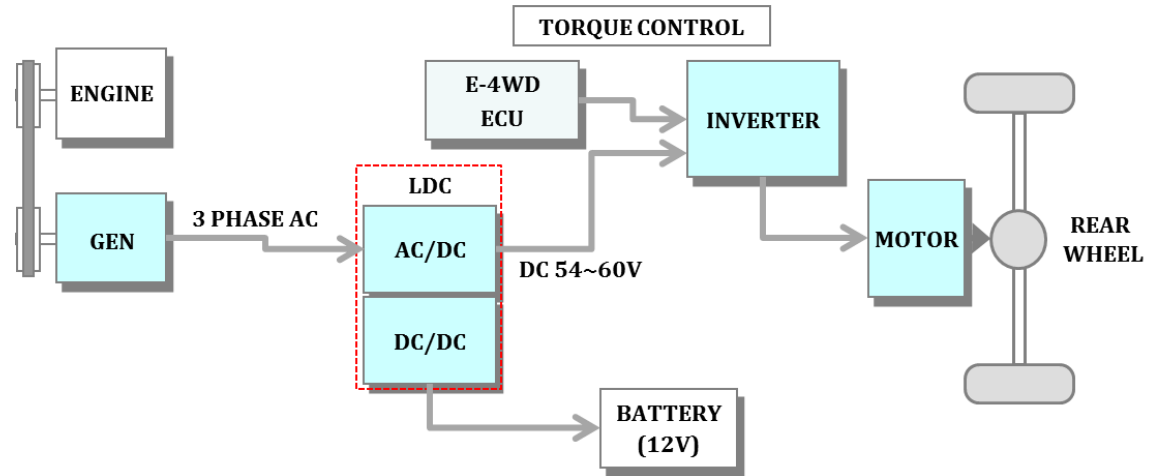
## MOTOR

➤ Max. Power: 31[kW]



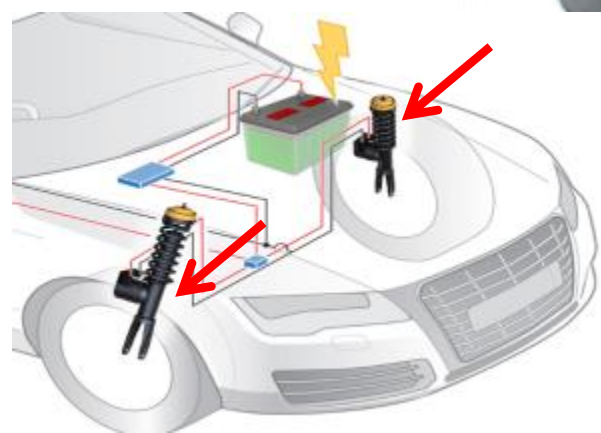
## CONTROLLER

➤ 3 Phase IGBT

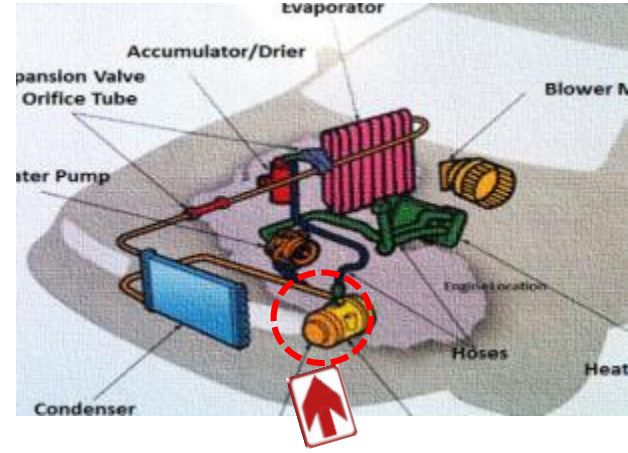


# APPENDIX. AUTOMOTIVE - OTHERS

**REGENERATION DAMPER**



**AIR CONDITION PUMP**



**MOTOR**

➤ Max. Power: 5.5[kW]

**CONTROLLER**

➤ 3 Phase IGBT
















# DEFENSE APPLICATIONS

Category	Applicatin	Items	Development Period	Development Contents	Remark
Ground Weapon System	Self-Propelled	Turret direct drive motor	2011 ~ 2013YR	 <p>[Turret direct drive motor]</p>	1. Direct drive motors that rotate the tank turret.
	Unmanned combat vehicle	Traction motor	2014 ~ 2015YR	 <p>[ Traction Motor ]      [ Generator ]</p>	1. Motors mounted on wheels of unmanned gun vehicles to move vehicles 2. Generator for vehicle power source battery charging
		Generator			
	Hybrid vehicle	Generator	2015YR	 <p>[ Generator ]</p>	1. Generator for electric battery charging of hybrid military vehicles



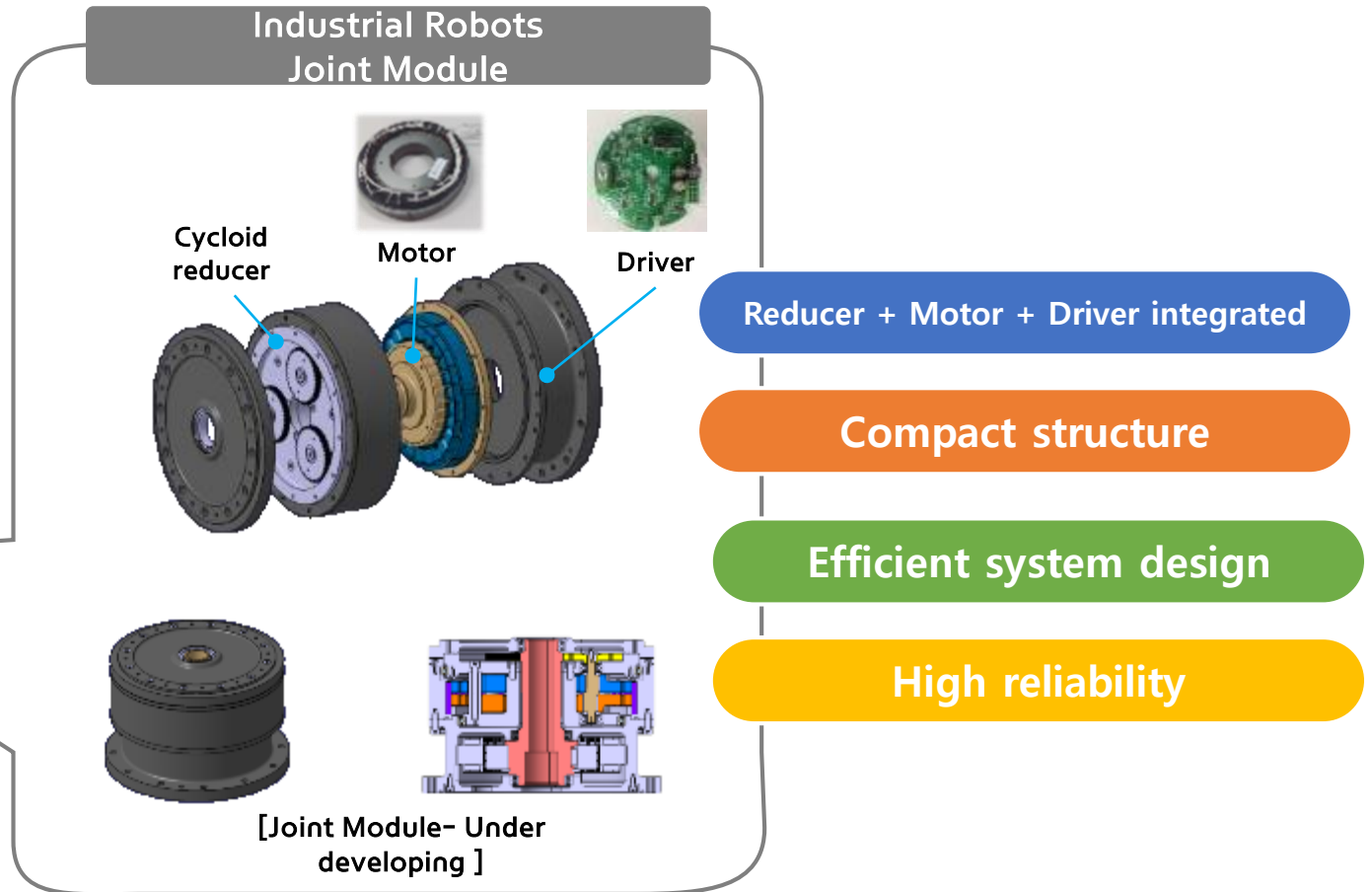
Category	Application	Items	Development period	Development contents	Remark
Guided Weapon System	Long range Surface to Air Missile Multi function radar (L-SAM MFR Radar)	Electric Jack	2015 ~ 2019	  [Electric Jack]  [Electric Jack driver] <p>Rated load : 18ton , Rated speed : 4mm/s , Stroke : 900mm</p>	1. Electric jacks to level and keep horizontally and vertically at radar vehicles and missile launcher vehicles
		Electric Jack driver			
Guided Weapon System	Very High Frequency (VHF Radar)	Antenna expansion device	2017 ~ 2019 (On-going)	  [Rotating system]  [Antenna expansion device]  [Electric Elevation]  [Electric Elevation Driver] <p>Rated load : 10ton , Rated speed : 14mm/s , Stroke : 900mm</p>	1. Electric Elevation to lift the radar vertically
		Electric Elevation			
		Electric Elevation Driver			
		Rotating system			

Category	Application	Items	Development period	Development contents	Remark				
Aviation weapon system	Medium altitude unmanned Aerial Vehicle (MUAV)	Gimbal	2015		 <b>Power: 170W</b> [ Roll/Pitch motor]	 <b>Capacity: 50W</b> [ IR detector PS/OD board]	1. Motor and controller of EOTS system mounted on unmanned airplane		
		IR detector PS/OD board							
		EO detector OD board						 <b>Capacity: 50W</b> [ EO detector OD board]	 <b>Capacity: 50W</b> [ BSM controller]
		BSM controller							
	Target acquisition and Designation System (TADS)	heat exchanger	2016 ~ 2019		 <b>Cooling capacity:320W</b> [heat exchanger]	 <b>Capacity: 50W</b> [ EO OD controller]		1. EOTS system heat exchanger and controller mounted on helicopter	
		EO OD controller							
22" unmanned aircraft (EOTS)	22" unmanned aircraft (EOTS)	Linear Motor	2010		 <b>Power: 410W</b> [Linear Motor]	 <b>Capacity: 50W</b> [ IR detector PS/OD ]	1. Motor and controller of EOTS system mounted on unmanned aircraft		
		IR detector PS/OD board							
		EO detector OD board						 <b>Capacity: 50W</b> [ EO detector EO board]	 <b>Capacity: 50W</b> [Gimbal amp board]
		Gimbal amp board							

# ROBOT APPLICATIONS

# ◆ Robot application

✓ Robot Joint Module



# ◆ Robot application

✓ Collaborative Robots Joint Module (Development performance)

Customer	Application	Item	Development	Details	Remark
Hanhwa	Collaborative Robots	60 W Robot Joint Driver	2016~2017		-
		400 W Robot Joint Driver			-

# SHIPBUILDING, AVIATION APPLICATION

# ◆ Shipbuilding, Aviation application



[ Steering Motor & Controller ]



[ Propulsion motor ]



[ Propulsion motor ]



[ Drive controller ]



[ Electric Ship ]



[ Electric Flight ]



**Thank you**