

A graphic consisting of three interlocking circles in blue, orange, and grey, connected by thin grey lines. The circles are arranged in a triangular pattern, with the blue circle at the top, the orange circle at the bottom left, and the grey circle at the bottom right. The background is a gradient of blue with abstract wavy shapes in orange and grey.

COAVIS

Global Leader In Electric Pump Systems



Enterprise leading automotive system technology


















Mission Reliable Global COAVIS inspired by Customer Impression.

Vision Winning the first place in market share of fuel pumps providing Top Global Automakers and achievement of sales up to KRW 500 billion by 2025 and proper operating profit by expansion of green cars' parts business.

Core Value
 Fairness
 Respect
 Cooperation
 Challenge



CONTENTS

 03 CEO Greeting	 13 Components for Fuel Pump Module
 04 COAVIS Global	 14 DC Fuel Pump
 04 Milestones	 15 BLDC Fuel Pump
 05 Awards	 17 Electric Water Pump
 06 Research & Development	 20 Quality & Environmental Management System
 07 Reliability Test Center	 22 Smart Factory
 08 Business Area	 23 Facilities
 10 Fuel Pump Module	 25 Major Customers
 12 Fuel Pump Module for LPG and Motorcycle	



Customer is our final arbiter!

In COAVIS, the single most important governing principle is "Customer is our final arbiter!". Without satisfied customers, we exist no more. It is as simple as that.

To ensure we keep our customers happy and satisfied, We are doing the following:

- We deeply care about what our customers want.
- We listen to our customers and then act quickly.
- We keep making improvements in everything we do.
- We make promises and always keep our promises.

This has led us to a small success so far, which also has contributed to the success of our customers. We're looking at much larger business in the forthcoming years together with our customers. Keeping the same principle and repeating the same behaviors will certainly bring significantly increased value to our customers. Then it will ensure us to stay as a long-term business partner for our customers. We'll develop the parts and the systems optimized to a changing automotive system of our customers.

Thank you.



Germany Office (Wolfsburg)



Slovakia Plant (Trnava)



China Plant (Shenyang)



China Office (Shanghai, Changchun)



Korea Plant (H.Q. / Sejong-si)



USA Corp. (Detroit)



Mexico Plant (Monterrey)



Brazil Corp. (Sao Paulo)

Milestones



Awards

- 2019. Mar. Won the Supplier Quality Excellence award from GM
- 2018. Mar. Won the Supplier Quality Excellence award from GM
- 2017. Mar. Won the Supplier Quality Excellence award from GM/SGM
- 2016. Mar. Won the Supplier Quality Excellence award from GM/SGM
- 2014. Nov. Won the grand award '6th Small and Medium-sized enterprise IP management conference
- 2011. Mar. KB Hidden Star 500 enterprise selection
- 2010. Nov. Won the 70million dollar exports award on Day of Commerce
- 2008. Mar. National tax service commissioner's commendation of Daejeon region awarded on Taxpayer's Day
- 2004. May. Won the Grand Prize of Management in Chungnam Province
Apr. Won Value Added ISO Management System Award (in the Manufacturing business sector)
- 2003. Aug. Won Green Management Excellence Award from KPC (in the automobile & automobile parts industries)
- 2002. Jun. Won Supplier of Year Award from GM Korea
- 2001. Oct. Won Excellent Small and Medium Enterprise Award from Korea government



GM "Supplier of the Year award"
2007 | 2008 | 2009 | 2010 | 2011 | 2014 | 2015 | 2018



VW "Future Automotive Supply Tracks [FAST]"
2015-16 | 2017-18 | 2019-20

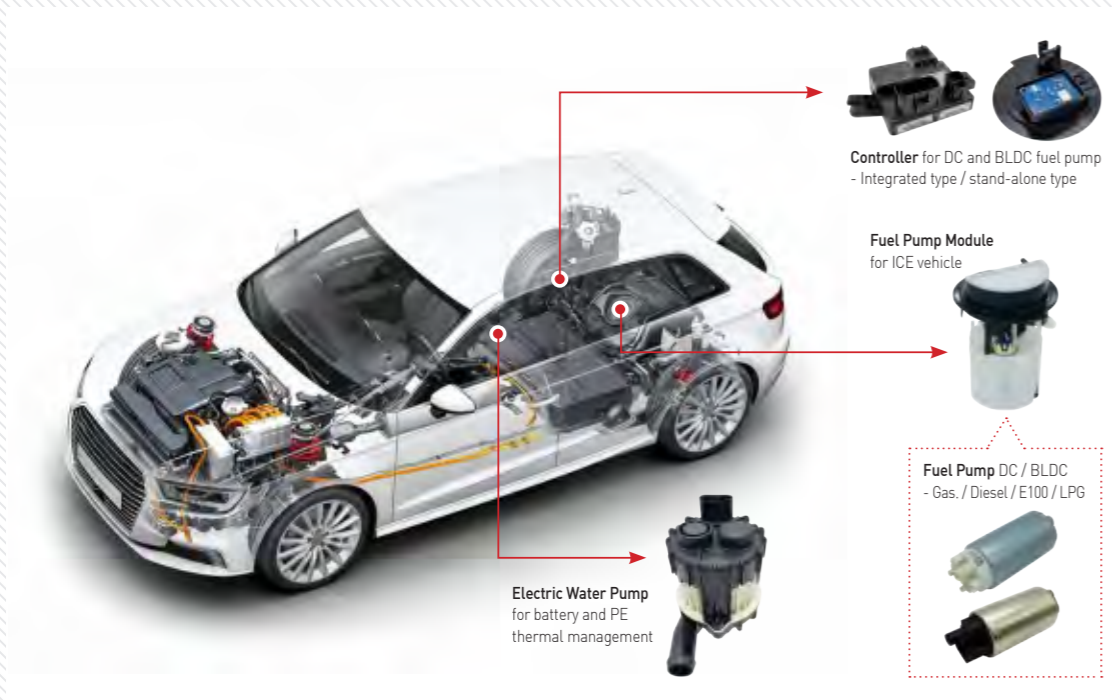
Research & Development



COAVIS technical research institute endeavors to take the fuel pump and EWP technology to the next level to satisfy the customers expectations for performance, cost competitiveness and robustness for every global market.

COAVIS is capable of designing the products using computational simulations for every development phase for EC motors, pumps, controllers and module structures.

With 100% in-house technology, the performance of products is always better than competitors and the lead time for development is minimized, providing the best cost competitiveness to the customers.



Reliability Test Center



COAVIS has in-house independent test laboratory equipped with several test facilities including safety fence/gas ventilation/ESD protection. Also, it is equipped with an automatic fire extinguishing system for safety from fire and has been certified by the Government.

FPM Performance & Safety Tester



COAVIS not only meets customer requirements for general performance, but also have equipments that can judge stability.

EWP Performance & Durability Tester



COAVIS have EWP Testers in order to evaluate both general performance and lifetime evaluation.

Long Term Durability Tester



The Reliability Test Center has more than 60 durability test chambers for lifetime evaluation. In addition to checking each customer's warranty period for the product, an internal limit test is performed on the product.

Environment & Vibration Tester



There are also several equipments that can be used to validate high & low temperature/Ozone/ESD/Vibration/damage by external load to evaluate when our products are exposed to critical environments.



Business Area

Fuel Delivery Systems

- Fuel Pump
- Fuel Pump Module
- Fuel Pump Controller
- Fuel Level Sensor

Electric Water Pump Systems

- Electric Water Pump
- Thermal Management System
- Fuel Level Sensor





Fuel Pump Module

Fuel Pump Module



Description

The fuel pump delivers fuel from tank to engine in order to meet the fuel delivery requirement of engine .
The fuel level sensor consisting of a float, a float arm, and a resistor card assembly, converts the fuel height into an electronic signal to indicate the remained fuel amount in the fuel tank.

Features and Benefits

- Fuel System : Return & Returnless
- Fuel Application : Gasoline & Diesel
- Application fuel pump : Turbine pump & Ge-rotor pump
- Superior fuel pump noise performance
- Bottom reference of reservoir systems and level sensor allow for tank tolerance variation

Performance characteristic

- Pressure ----- 0~580kPa (Adjustable by customer demand)
- Operating Voltage ----- 6~16V
- Shutoff Pressure ----- 650~900kPa (Adjustable by customer demand)
- Temperature Range ----- -40 °C - 70 °C (Gasoline)
----- -40 °C - 90 °C (Diesel)

Fuel Pump Module With In-tank Filter System



Description

The fuel pump module consists of a fuel pump, In-tank filter, pressure regulator, fuel level sensor reservoir body. The fuel pump delivers fuel from the tank to engine in order to meet the fuel delivery requirement of engine. The fuel level sensor consists of a float, a float arm and a resistor card assembly and it converts the fuel height into an electronic signal to indicate the remained fuel amount in the fuel tank.

Features and Benefits

- Fuel System : Return & Returnless (MRFS, ERFS)
- Application fuel pump : Turbine pump
- Meet emission requirement (LEV II, LEV III, PZEV)
- Superior fuel pump noise performance, improved low fuel driveability
- Bottom reference of reservoir systems and level sensor allow for tank tolerance variation
- Reservoir capacity ensures easy restart during low fuel or gradient conditions
- Guarantee of lifetime performance of ITF.
- Noble metal applicable to level sender for durability and signal quality.

Performance characteristic

- Pressure ----- 0~580 kPa (Adjustable by customer demand)
- Operating Voltage ----- 6~16V
- Shutoff Pressure ----- 650~900kPa (Adjustable by customer demand)
- Temperature Range ----- -40 °C-70 °C (Gasoline)
----- -40 °C-90 °C (Diesel)

Fuel Pump Module for Saddle Tank



Features and Benefits

- Fuel System : Return & Returnless (MRFS & ERFS)
- Dual (Supply & Suction) jet system for transferring fuel from secondary and primary tank & filling fuel into reservoir body
- Improved low fuel driveability
- Bottom reference of reservoir systems and level sensor allows for tank tolerance variation
- Reservoir capacity ensures restart during low fuel or gradient conditions
- ※ MRFS : Mechanical Returnless Fuel System
- ERFS : Electronic Returnless Fuel System



Fuel Pump Module for LPG and Motorcycle

Components for Fuel Pump Module

Fuel Pump Module for LPG Injection System



[LPGi Module]

► Features

- Fuel system : Return & Returnless
- Fuel Application : LPG
- Safety : Explosion proof in LPG

► Performance Characteristic

- Pressure sensor : Monitoring inside Tank
- Pressure : 150~350kPa
- Operating voltage : 8~15V
- Shutoff pressure : 500~850kPa
- Temperature range : -30~60°C
- Superior durability in LPG
- Fuel filter : Long life time filter(Optional)



[LPLi Module]

► Features

- Fuel system : Return
- Fuel Application : LPG
- Safety : Explosion proof in LPG

► Performance Characteristic

- Operating voltage : 8~15V
- Temperature range : -30~60°C in LPG
- Pressure : 300~600kPa
- Shutoff pressure : 800~1,200kPa
- Superior durability in LPG

Fuel Pump Control Unit



► Features and Benefits

- Control for DC Pump and BLDC Pump
- Customer's request applicable

Intank Filter Assembly



► Features

- Life time fuel filter
- Optimized & demanded design for system filtration retained capacity and filter efficiency as well as hot soak resistance durability

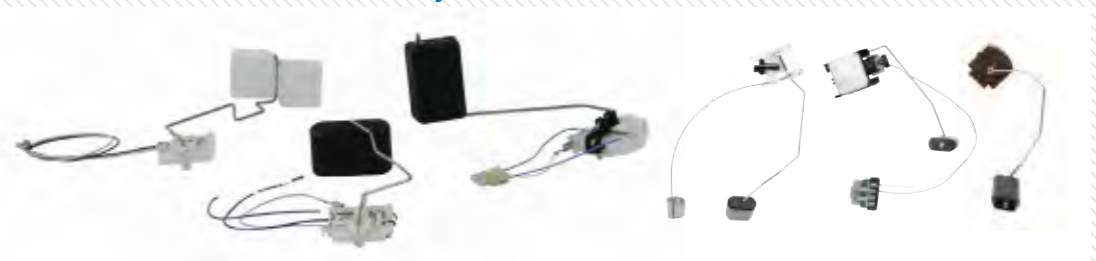
► Performance characteristic

- SAE J 905(Single Pass Standard)
- ISO TR 13353(Multi Pass Standard)
- JIS D 1608

► Electrostatic discharge (ESD)

- Fuel flowing passages connecting lower module to flange shall be conductive and grounded due to POM conductive material and design.

Fuel Level Sensor Assembly



► Features

- Contact Level Sensor : Single / Multi contactor, Sealed type
- Non-contact Level Sensor : USLS
- Fuel Application : Gasoline & E85 & E100 & Diesel(B20)
- Resistance Value : Depends on customer's specification

► Performance characteristic

- Operating Voltage : DC 5V ~ 24V
- Noble Material Application for contactor and ink



DC Fuel Pump

COAVIS Fuel Pump Application



Turbine Fuel Pump for Gasoline Application

► Description

The electric fuel pump is an electro-mechanical device contained within the Fuel Pump Module featuring single & multi stage turbine technology powered by DC motor, that interfaces with the strainer and the fuel filter.

► Features

- A wide range of fuel pump variants combined, providing the best solution for customer's requirements.
- Pump size(diameter) : Ø30mm for motorcycle application, Ø38mm for gasoline up to E100, Ø43mm for high performance vehicle combined with 5 different impeller design patented by COAVIS.
- A wide range of flow range and pressure (up to 400LPH @ operating condition)
- High efficiency with low current consumption (up to 30% @ operating condition)
- Low noise, vibration and pressure pulsation
- Superior hot fuel handling
- Outstanding fuel compatibility up to E100
- Single & Multi stage turbine technology

Ge-rotor Fuel Pump for Diesel Application

► Description

The electric fuel pump is an electro-mechanical device contained within the Fuel Pump Module featuring Ge-rotor technology powered by DC motor, that interfaces with the strainer and the fuel filter.

► Features

- Diameter : Ø43 mm / Ø38 mm
- Pump size depends on fuel delivery requirement
- Advanced tooth profile combined unique housing design patented by COAVIS
- A wide range of flow rates and operating pressures
- Enhanced low voltage performance
- High efficiency with low current consumption
- Low noise, vibration and pressure pulsation
- Hot fuel and contamination loss is negligible
- Blended fuel compatible Up to B30

BLDC Fuel Pump



COAVIS BLDC fuel pumps are an integration of COAVIS technology and experience as a Global player in the fuel pump market.

COAVIS BLDC fuel pumps deliver a wide range of flow rates with highest level of overall efficiency regardless of fuel type. With combination of two different BDLC motors (different capacity) and three different types of impeller designs, COAVIS fuel pump line-up covers most of customer requirements.

The reliability and robustness of COAVIS fuel pumps have already been proved since launched in the global market.

► Benefits

- Satisfying most of customers requirements, from fuel-efficient vehicles to performance vehicles with extreme performance.
- Market leading overall efficiency thanks to high efficient BLDC motor and turbine design
- Highly efficient in a wide range of operating condition
- Field-proved reliability and durable characteristics
- Highest level of cost competitiveness thanks to cost-effective design

► Design overview

• Rotor assembly

- Neodymium magnet (Injection + POM Over molding)
- Optimized core design for performance

Stator assembly

- Inner winding (performance prioritized)
- Simple and robust connection (coil vs. terminals)

• Impeller

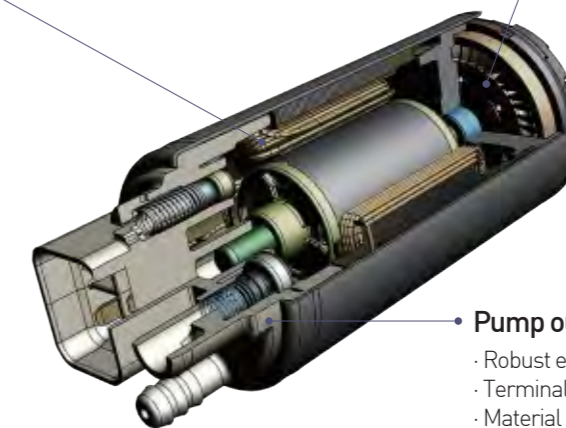
- High efficient blade design with both higher discharge per Rev. (patented by COAVIS)
- Asymmetric blade angle
- Random & irregular blades
- Material : PPS

• Casing

- Flow channel with maximized pressurizing length with aggressive degassing hole position
- Optimized for both performance and hot fuel handling capability
- Material : Aluminum (anodized)

• Pump outlet

- Robust electrical connection to stator
- Terminals insert-molded (U, V, W, neutral)
- Material : PPS





BLDC Fuel Pump

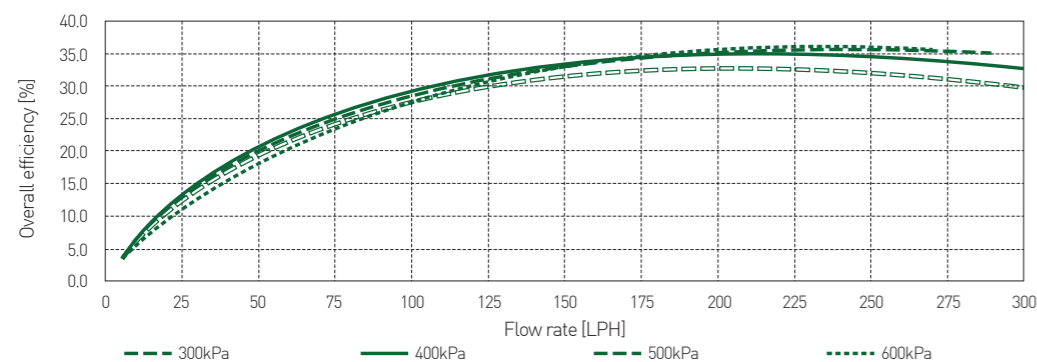
Electric Water Pump

BLDC Fuel Pump Line-up

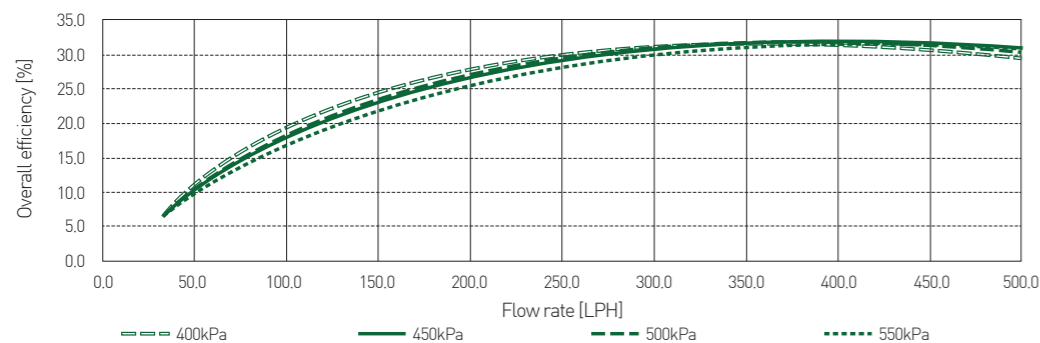
Model name	38EG1.0 series	43EG1.0 series	38ED2.0 series	43ED1.0 series
Pump Configuration				
Motor	BLDC	BLDC	BLDC	BLDC
Diameter [mm]	38.0	43.0	38.0	43.0
Height [mm]	96.6	97.5	86.5	97.5
Mechanism	Regenerative	Regenerative	Regenerative	GEROTOR
Fuel Application	Gasoline, E30	Gasoline, E30	Gasoline, Flex fuel up to E100	Diesel, B20
Ave. flow @ 12.0Vdc	260LPH @ 500kPa	410LPH @ 500kPa	280LPH @ 500kPa	330LPH @ 500kPa
Max. Efficiency	30-33%	25-30%	32-35%	30-32%
Status	Serial production	Serial production	Validation to be completed in 2020	Serial production

Efficiency curve

38EG1.0 series @ 12V including PEM / Gasoline



43EG1.0 series @ 12V including PEM / Gasoline



COAVIS Electric Water Pump is a type of Centrifugal pump powered by BLDC motor. COAVIS EWP provides best in class overall efficiency with maximum flow rate thanks to the most efficient BLDC motor and turbine design, satisfying every customer's requirements.

The embedded controller provides robust controllability and optimized performance with Field-Oriented Control method, which is the most advanced commutation method available.


The highest level of cost effective design of COAVIS EWP also provides benefits to customers with the most competitive cost without compromising performance and reliability.

Benefits


- Market leading overall efficiency thanks to high efficient BLDC motor and turbine (Impeller) design, which were optimized by CFD analysis.
- A broad range of efficiency curve, covering most of customers needs for thermal managing of electrified vehicle systems.
- The highest level of cost competitiveness thanks to cost-effective design.

New to the market with highest performance and reliability


01 Gen1.0 EWP
50W ~ 80W
Flow : Min. 2,000LPH @ 60kPa
Efficiency : Min. 35%
PWM & Lin



02 Gen2.0 EWP
80W ~ 100W
Flow : Min. 1,500LPH @ 100kPa
Efficiency : Min. 40%
PWM & Lin



03 Gen3.0 EWP
50W ~ 150W
Flow : Min. 1,500LPH @ 150kPa
Efficiency : Min. 40%
PWM & Lin



2017 ~ 2019
· Validation completed (via. GM)
· Vehicle durability completed (by BYD)

2019 ~ 2020
· Validation completed in 2020
· High efficiency and cost competitiveness focused
· Production ready

2020 ~
· COAVIS EWP line-up completed from 50W to 150W
· Production ready by 2022



Electric Water Pump



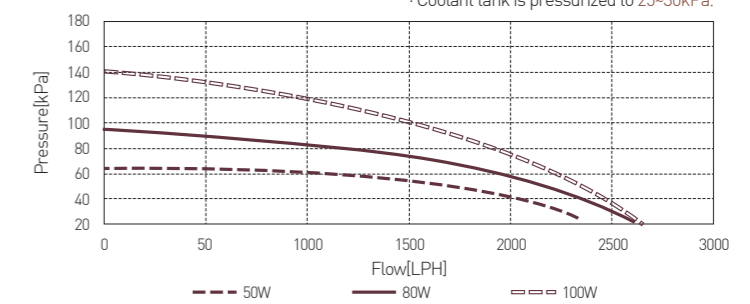
Classification	Description
Motor	BLDC, 3phase Sensorless
Connection	STAR connection
Magnet	Neodymium PPS binder_injection
Control	Field Oriented Control
Configuration	4poles, 6coil winging slots
Pumping Mechanism	Centrifugal pump
Operating voltage	9.0Vdc~16.0Vdc
Communication	PWM, LIN
Protection	<ul style="list-style-type: none"> · Inverse-polarity protection · Short-circuit proof signal pins · Dry running shutdown, Stall shutdown · Overvoltage shutdown, Over temperature · Rotation speed feedback · DTC

Model	50W	80W	100W~120W	150W
Pump Configuration				
Max. flow [LPH] @ system pressure	1400 @ 50kPa 900 @ 80kPa	1800 @ 60kPa 1200 @ 80kPa	2400 @ 60kPa 1500 @ 100kPa	3000 @ 60kPa 1500 @ 150kPa
Max. Pressure [kPa]	90	100	140	200
Max. Efficiency [%]	Min.40	Min. 40	Min.40	Min.45
Voltage [Vdc]	9.0~16.0	9.0~16.0	9.0~16.0	9.0~16.0
Communication	PWM, LIN	PWM, LIN	PWM, LIN	PWM, LIN
Status	Production ready	Production ready	Under validation	Under development

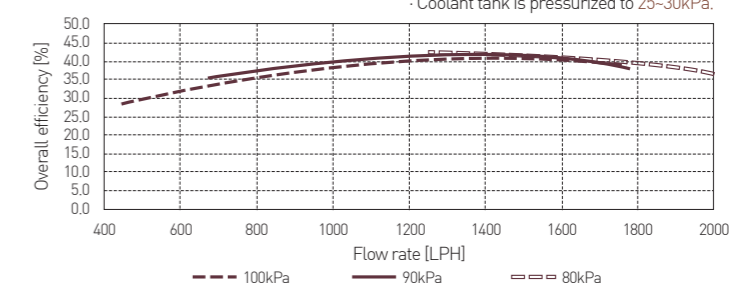
► Key design features

- Controller**
 - COAVIS patented electrical connection
 - Optimized heat dissipation capacity
 - Simple and robust electrical connection (PCB to EC motor)
- Turbine design**
 - High efficient turbine (blade) design
 - Optimized for outstanding NVH performance
 - Unique design to integrate bushing with rotor
- BLDC motor design**
 - Highest power density
 - Aggressive down sizing in packaging without compromising performance
 - Winding slots and pole pairs optimized for high RPM range

► P-Q curve @ Constant speed (Max. speed)



► Efficiency (100W @ 6000RPM)

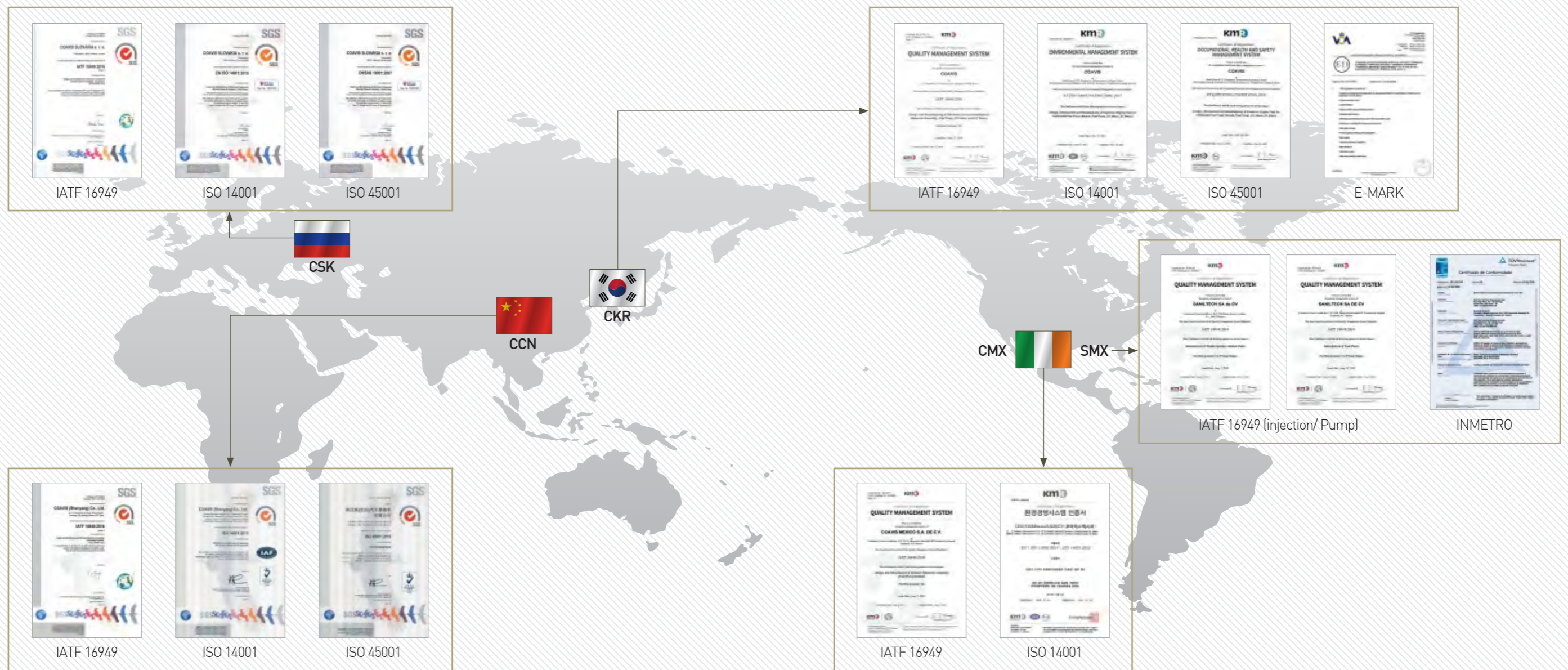




Quality & Environmental Management System

We have accomplished company-wide quality & environmental management systems through global Management standards ; IATF 16949 (ISO/TS 16949) certification since May 2005, ISO 14001 certification since Mar. 2003, INMETRO certification since Jun. 2013, and ISO 45001 (OHSAS 18001) certification since Nov. 2016.

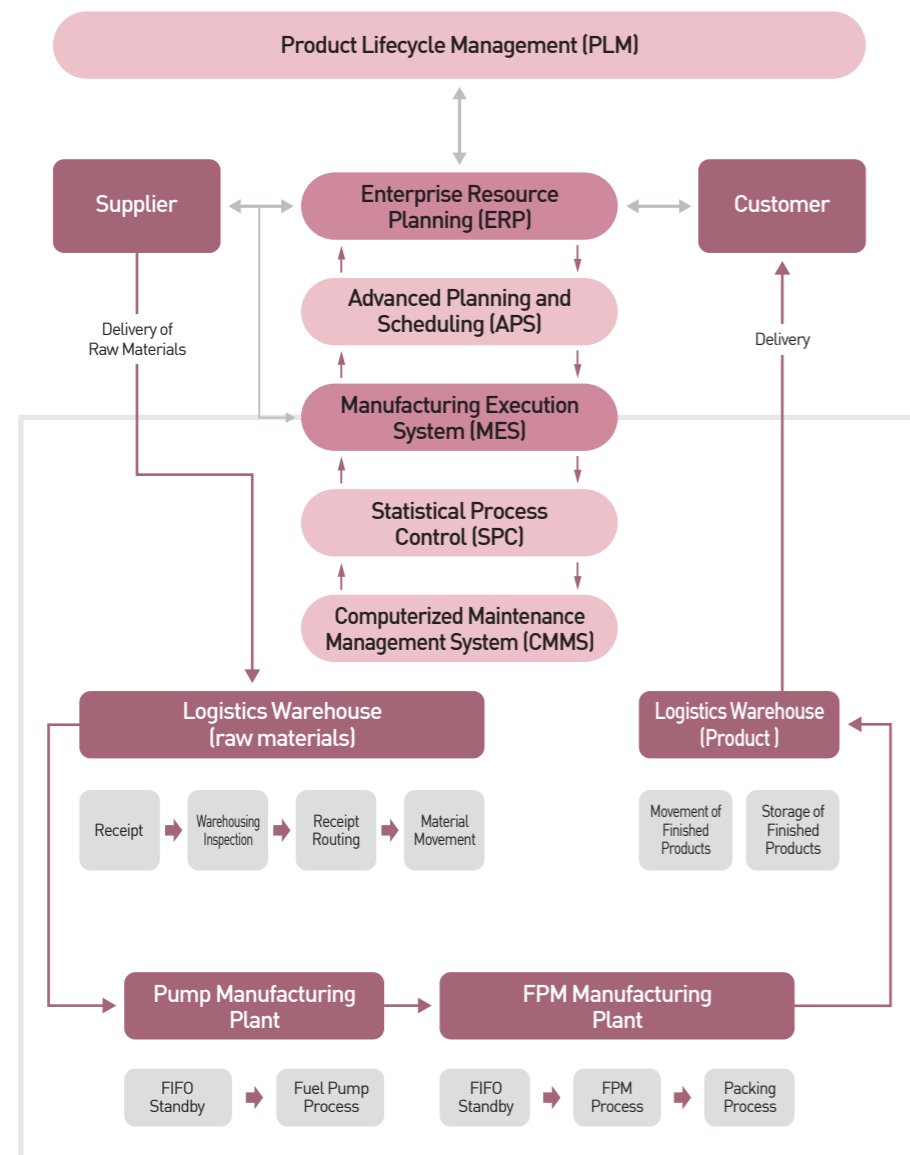
We are making efforts to improve quality and reliability in every aspect of our company, and always thinking of the preservation of our environment. It means that we are focusing on environmentally compatible products and the economic efficiency of company activities. As a result of our ongoing activities, COAVIS won the Korea Green Management Excellence Awards in Aug. 2003. And we got certificated in Hyundai-Kia Motor's SQ Mark in May 2007 and in GM's BIQS Level 5 in Dec. 2018.



COAVIS has established a system to improve productivity, reduced product defect rate, and prevented improper shipment to all global plants. Through this system, we grasp the production status in real time and actively respond to changing external environments and customer needs.

The smart factory system of COAVIS is composed of the main systems such as Product Lifecycle Management (PLM), Manufacturing Execution System (MES) and Enterprise Resource Planning (ERP), and the sub systems such as Advanced Planning and Scheduling (APS), statistical process control (SPC) and Computerized Maintenance Management System (CMMS). We are organically managing all processes of product development, production, and shipment.

COAVIS has established a product development system based on ICT, constructed an efficient production system through supply chain management, computerization of logistics, facility automation, and process automation, and realized a smart factory by managing all corporate resources through ERP.



FPM Assembly Line



- Automated FPM Assembly Line
- Performance Test M/C

FPM Assembly Line



- FPM Assembly Line
- Performance Test M/C

EWP Production Line



- Assembly Line
- Inspection M/C

EWP Performance tester



- Inspection M/C for delivery performance

DC Pump Line



- Assembly Line
- Inspection M/C

BLDC Pump Line



- Assembly Line
- Inspection M/C

Armature Line



- Assembly Line
- Inspection M/C

Stator Line



- Assembly Line
- Inspection M/C

CNC & Injection Molding M/C



- CNC M/C
- MCT M/C

Impeller Grinding Line



- Assembly Line
- Inspection M/C

Leak Test Line

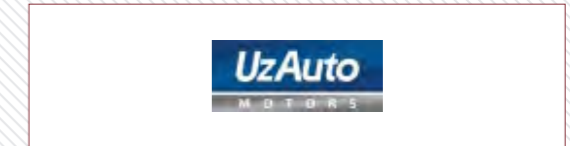
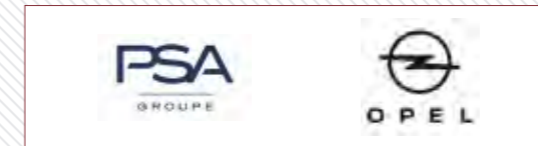


- Flange/Support bar Assembly M/C
- Flange Assembly Leak Test M/C

Resistor Card Line



- Printing M/C
- Furnacing M/C
- Automated Trimming M/C





117, Gongdan-ro, Yeonseo-myeon, Sejong, Korea
TEL : +82. 41. 860. 6000 FAX : +82. 41. 863. 1006
E-mail : coavis@coavis.com
www.coavis.com