

GMORS[®]
Seals to your heart

Sealing Solutions for
Automotive Industry



Certified GMORS

GMORS is a leading Taiwan supplier of rubber seals to Tier II and Tier III for light vehicle and heavy truck systems in automotive industry. Developing in automotive industry for 20 years, we provide sealing solutions to customers from Europe, Japan, North America, China, South Korea and Thailand. GMORS produces both non-safety and safety parts, according to IATF 16949:2016 process and customer's requested procedures. GMORS offers professional advice to customer's new vehicle design and market-led seal parts. We listen to all customers' demand, and design compatible rubber material, seal shape and prototype for trial run. We collect customer's test feedback and update our DFMEA (Design Failure Mode and Effects Analysis) for next improvement until customers feel satisfied.



In-house Laboratory

To react promptly to customer's need for research and development, GMORS develops in-house laboratory and chemical engineers to design, mix and test rubber recipe. GMORS laboratory is equipped with advanced testing equipments and knowledgeable engineers. Moreover, GMORS laboratory follows rigorous procedures, which are certified by TAF (ISO17025). According to ASTM requirements, "TGA", "FTIR" and "3 Sigma" standard deviation measures are used to check the performance of mixing quality per batch for quarterly or annual revalidation. GMORS has more than 100 rubber materials that meet automotive specifications and are also certified by automotive customers.



Mold Design

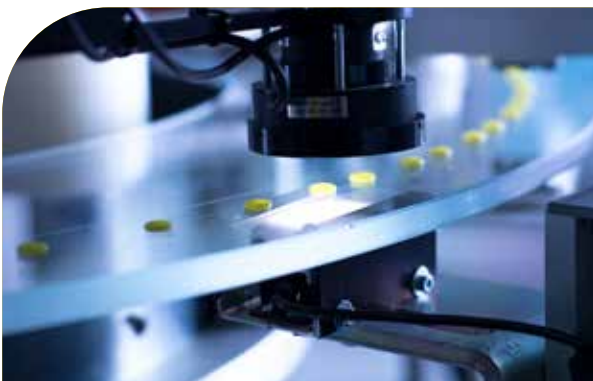
GMORS owns a mold shop with 3 axial and 5 axial CNC cutting machines to offer high-level seal surface finish. Highly precise cutting guarantees consistent dimension in each cavity. Also, the mistake proofing device can avoid mismatch and mold operation damage for long molding cycles.



Quality Assurance

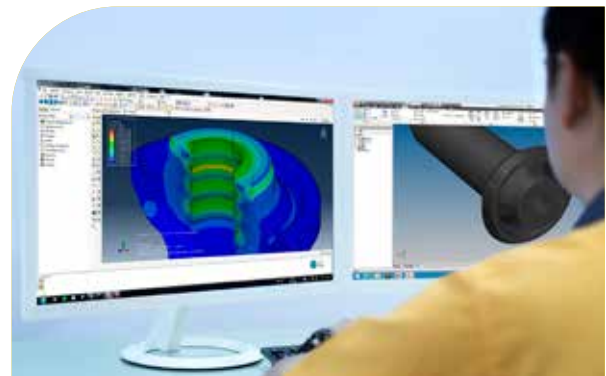
10% lower "gauge R&R" (Repeatability and Reproducibility) measuring equipments are used to make sure all dimension results are right. $CPK \geq 1.33$ and $PPK \geq 1.67$ are required and further prove GMORS capability and all records are utilized for constant improvement.

MES (Manufacturing execution system-barcode system), a control system for managing and monitoring work in process on a factory floor, provide reliable traceability.



Excellent Engineering team

To meet customer's requirements for the product, GMORS engineering team applies advanced equipment and a variety of design tools. The use of finite element analysis (FEA) helps GMORS to provide optimum sealing solutions for each customer's requests.



Cost Reduction

PPAP level III is our standard documents for automotive. Except control plan are divided into two sections: non-safety and safety parts. GMORS R&D engineers will design process for non-safety and safety issues according to the details of drawing, material specification and risk coefficient from technical review and analysis with customers.

For tracing and PPAP re-submission, PLM (Product Life-cycle Management) software system manages PFEMA, controls and records all "ECN" (Engineer Change Note) and "ECR" (Engineer Change Requirement) which need to be approved by right auditors. "Part Born" and "Process Born" in SAP system can calculate "Run at Rate" to guarantee 100% delivery performance. Via SAP finance system, we analyze actual cost for each process to figure out where the cost is wasting. "6 Sigma" and "TPM projects" can help reduce the defect rate, and therefore, cost reduction is supervised quarterly and annually.

Cleanroom Class & Cleanliness of Components

Cleanroom Class - Class 100,000 Cleaning, Inspection, Package



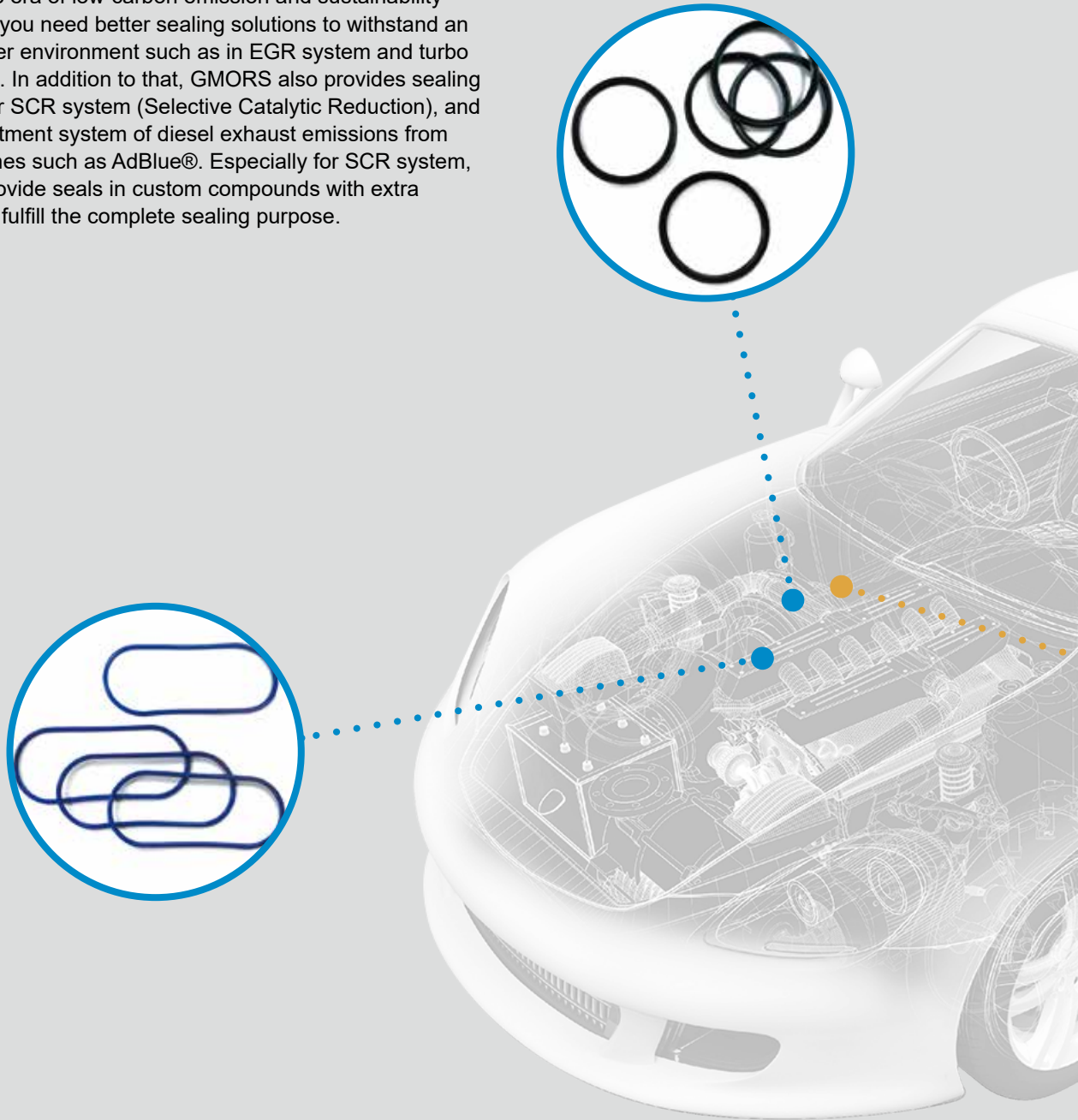
Cleanliness of Components

Customer Special Requirement - Cleanliness of components
CCC=A(D14/E12/F9/G6/H3/IJK00)

| Code | Particle Size | Contamination Level | Number of particles per | |
|------|---------------|---------------------|-------------------------|-----------------|
| | | | More than | Up to (include) |
| D | 25-50 | 14 | 8,000 | 16,000 |
| E | 50-100 | 12 | 2,000 | 4,000 |
| F | 100-150 | 9 | 250 | 500 |
| G | 150-200 | 6 | 32 | 64 |
| H | 200-400 | 3 | 4 | 8 |
| I | 400-600 | 00 | 0 | 0 |
| J | 600-1000 | 00 | 0 | 0 |
| K | >1000 | 00 | 0 | 0 |

Intake & Exhaust System

Entering the era of low-carbon emission and sustainability imperative, you need better sealing solutions to withstand an even harsher environment such as in EGR system and turbo intercoolers. In addition to that, GMORS also provides sealing solutions for SCR system (Selective Catalytic Reduction), and for aftertreatment system of diesel exhaust emissions from diesel engines such as AdBlue®. Especially for SCR system, GMORS provide seals in custom compounds with extra reliability to fulfill the complete sealing purpose.

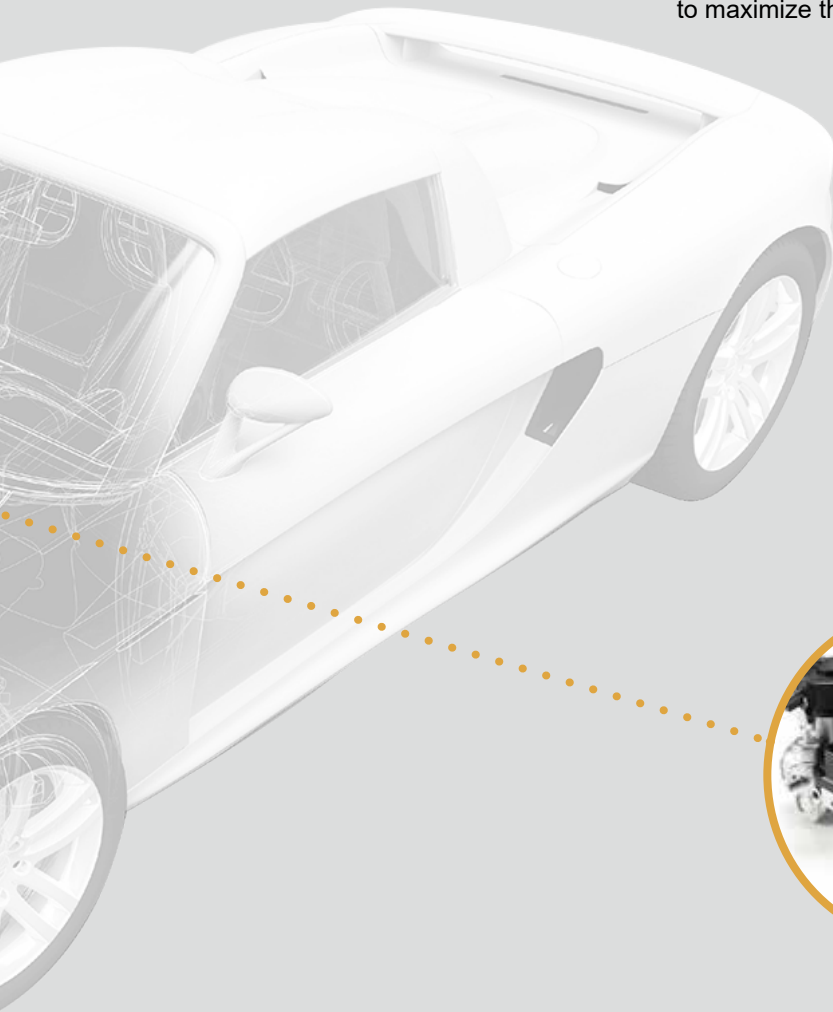


| Intake and Exhaust System | Material | Compound |
|---|---------------------------|----------------------------|
| Intake Manifold | Silicone | S5012AP |
| EGR System (Exhaust Gas Recirculation) | FKM ¹⁾ HNBR | V5731AA、V7014AA H6029AA |
| Exhaust Manifold (Blow-By gas / AdBlue®) | HNBR EPDM | H7019AK E7002AA |
| O ₂ Sensor | FKM | V8040AA |

1) GMORS compound have been approved by automotive customers.

Braking System

Seals in braking system are the most "system critical" automotive components. GMORS understands your concern and need. We ensure you a reliable control of braking function by providing you with optimum sealing solutions. We can meet requirements for hydraulic, pneumatic circuits, and system control. GMORS strict process control is to assure seals of working conditions like compression set, stress, strain, creep and etc. GMORS also increase seal's friction and wear in order to maximize the service life.



Intake and Exhaust System

Braking System

Fuel System

Cooling and Air Conditioning System

Transmission and Steering System

Sensor

Truck and Railway Air Brack System

Electric Vehicle System

| Braking System | Material | Compound |
|-----------------------|--------------------|-----------------------------|
| Fluid Brake DOT#3,4,5 | EPDM ¹⁾ | E7905AA 、 E7005AA 、 E8005AA |
| Braking System | EPDM | E6935AA 、 E8105AA 、 E8005AA |

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Intake and Exhaust System

Braking System

Fuel System

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Transmission and Steering System

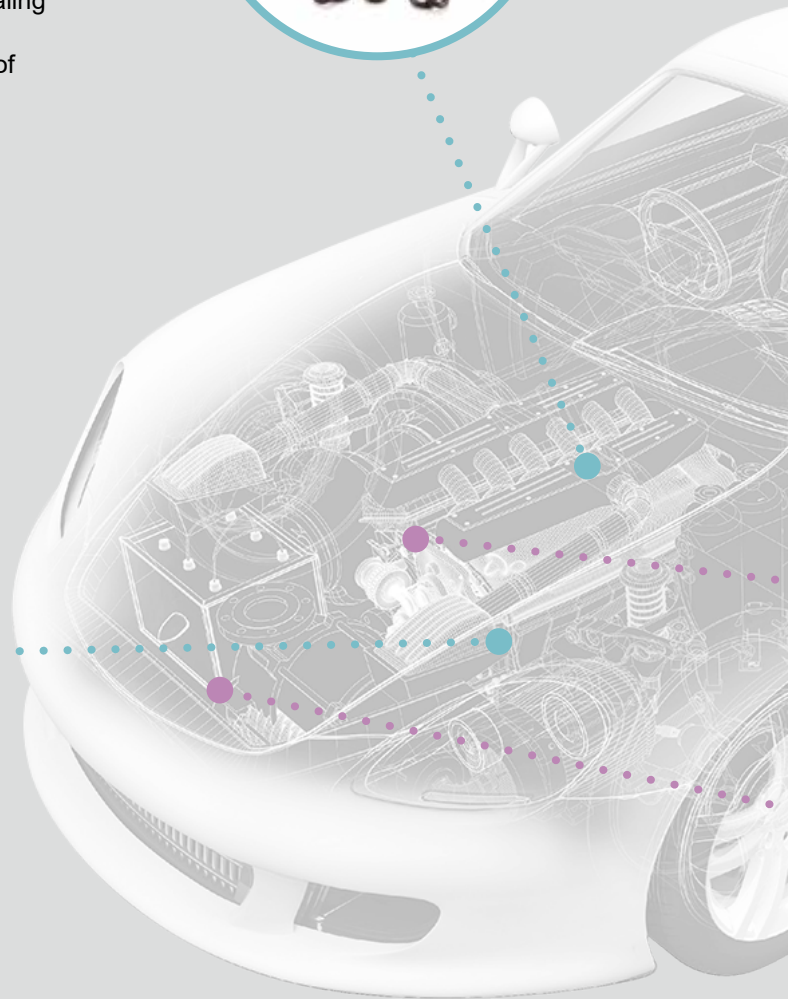
Sensor

Truck and Railway Air Brack System

Electric Vehicle System

Fuel System

Seal application in fuel system is regarded as safety critical with challenging requirements. Therefore, in early stage of development, GMORS is able to design compounds according to kinds of sealing considerations, and test under harsh environments, such as volume expansion, erosion-resistance, and different additives. GMORS sealing solutions apply to a variety of biodiesel, rapeseed methyl ester (RME), flex fuel, compressed natural gas (CNG), liquid petroleum gas (LPG) and so on. We can also meet your need for new fuel alternatives. For instance, in high-pressure diesel systems, GMORS ensure sealing solution of the low permeability and the high sealing reliability (such as injector) for a successful function of engine even in challenging working environments.

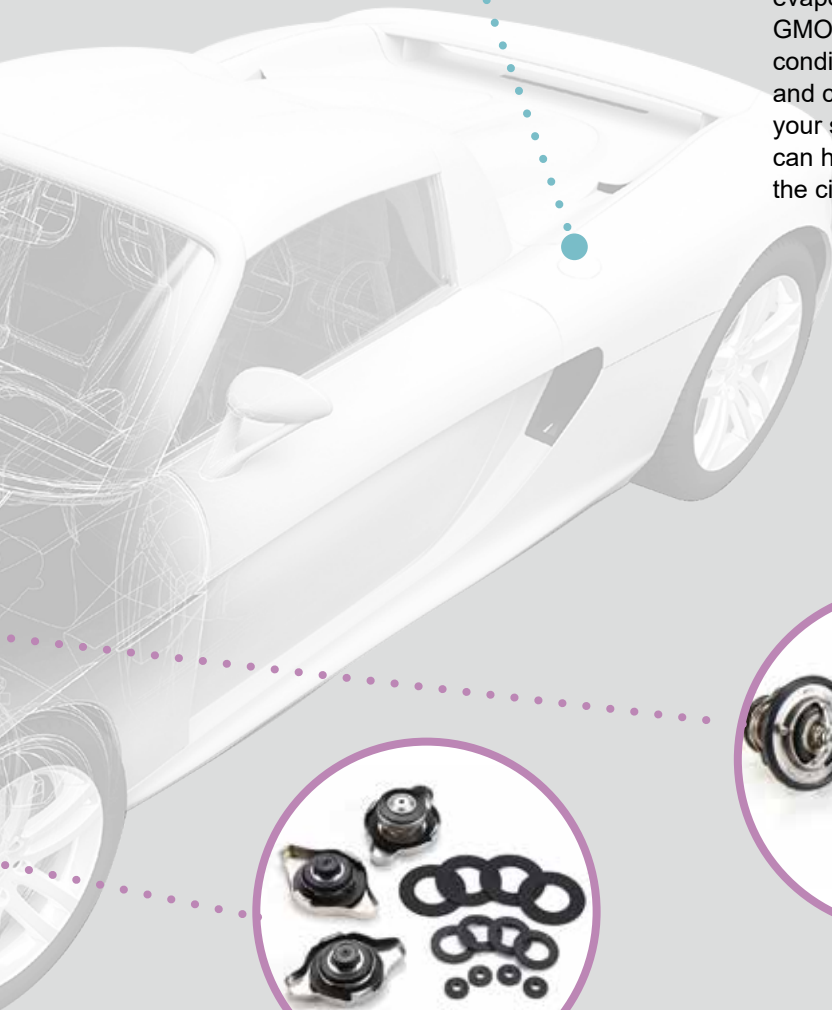


| Type of gasoline | Material 4) | Compound |
|----------------------------|-----------------------------------|------------------------------|
| Unleaded Fuel | FKM 1) 2) | V6015AA 、 V7000AA 、 V7015AA |
| Diesel | FKM 1) 2) | V6015AA 、 V7000AA 、 V7015AA |
| Biodiesel | FKM | V7000AA 、 V7817AA |
| Biofuel | FKM 1) 2) | V7000AA |
| LPG (Liquid Petroleum Gas) | Fluorosilicone 1) 3) NBR 5) 6) | F7004AO N7060AA 、 N7017AA |

- 1) GMORS compounds have been approved by automotive customers.
- 2) GMORS has general compound (-20° C~200° C) and low temperature compound (-40° C~200° C).
- 3) Fluorosilicone service temperature is -70° C~200° C.
- 4) Surface coating is available to reduce assembly friction.
- 5) UL157 certification.
- 6) EN549 certification.

Cooling and Air Conditioning System

When water temperature of the engine is increased to a greater mobility of the fuel oil, leading to better fuel economy, the seal has to be able to withstand a higher temperature cooling environment. GMORS high-performance materials with good compression set and stress relaxation property. Excellent property materials meet the latest regulations on refrigerants and the environments, and suit applications of condenser, evaporator, compressor, various valves, and sensors. GMORS offers perfect sealing solutions to stand the conditions such as permeability, chemical resistance, and control of volume expansion. And according to your system's refrigerant, GMORS sealing solutions can help prevent and control the refrigerant loss from the circuit.



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| Cooling System | Material | Compound |
|----------------|----------|-------------------|
| Radiator | EPDM | E6502AA · E5002AA |
| Thermostat | HNBR | H6509AR |

| Air Conditioning System Medium | Material | Compound |
|--|--------------------|-----------------------------|
| Freon R-134a ²⁾ ,HFO-1234yf | HNBR | H7013AA · H7000AA · H6915AA |
| Freon R-134a ²⁾ ,PAG(lubricant) | EPDM ¹⁾ | E7579AH · E6935AA |
| R744(CO ₂) | HNBR EPDM | H7013AA E7679AH |
| Freon R-12,R-22 | Neoprene/ CR | C7100AA |

1) Rubber materials have been approved by VOLKSWAGEN TL 524 32.
2) Freon R-134a and synthetic lubricant with PAG or POE.

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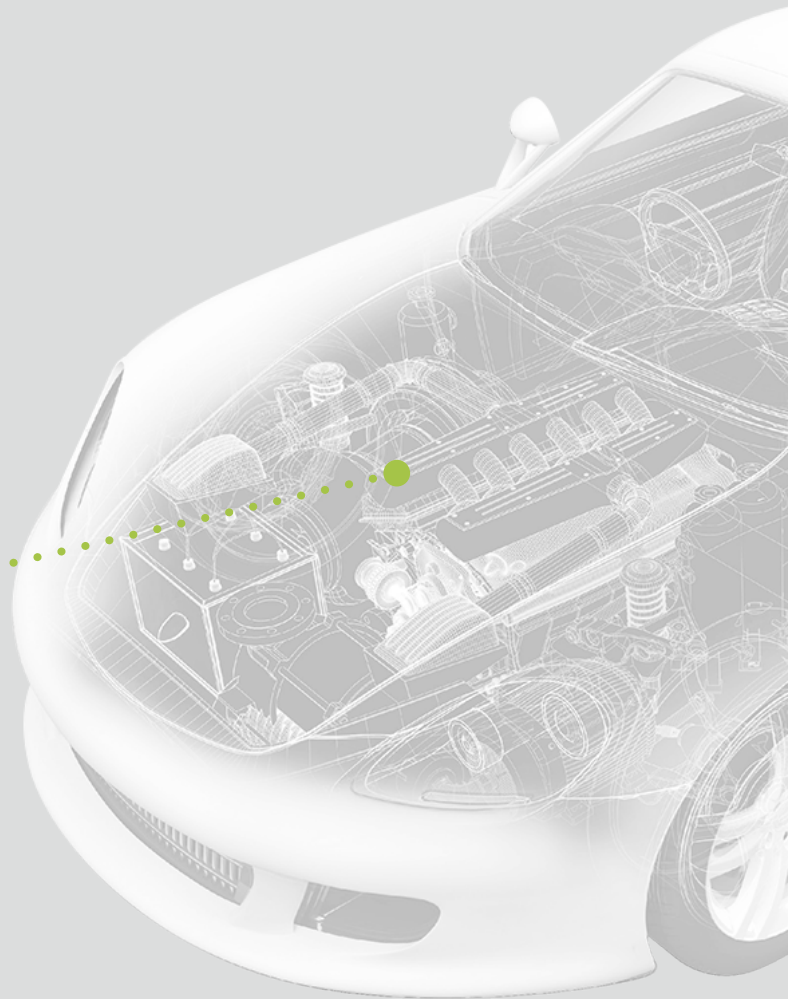
Sensor

Truck and Railway Air Brack System

Electric Vehicle System

Transmission and Steering System

Designers of transmission and steering system are usually challenged to improve the system performance, such as by reducing size, integrating application structure and enhancing system efficiency. Therefore, seal with multi-function feature is required. GMORS engineering team can meet your request for the design and development of new series, providing seals with low noise, low friction / wear, and long service life. Under high pressure and high speed working environments, a total sealing solution also helps to eliminate noise vibration.



| Transmission Fluid Resistance | | Material | Compound |
|-------------------------------|-----------|----------|-----------------------------|
| DEXRON III | DEXRON VI | | |
| V | | FKM | V7500AA · V7500AB · V7531AA |
| V | V | | V7544AA |
| V | V | VAMAC | G7506AA · G7105AA · G7513AA |
| V | V | ACM | P7000AA |

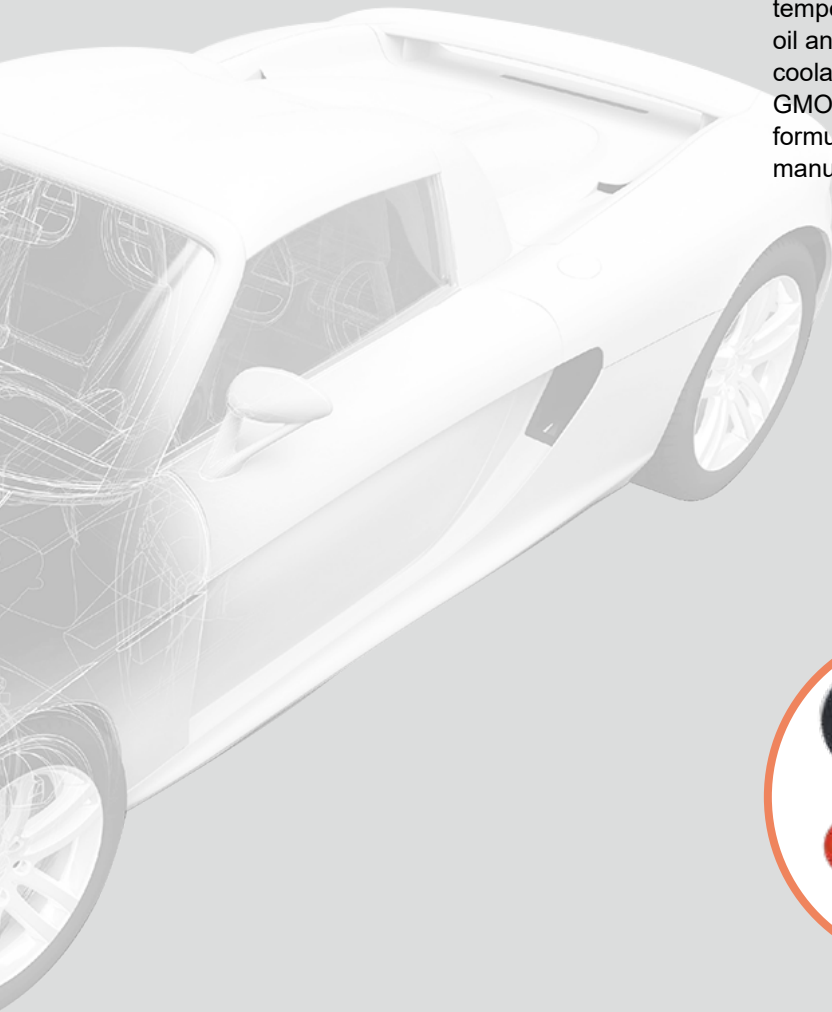
| Steering System | Material | Compound |
|-----------------|-------------------|--------------------|
| Columns | HNBR 1) | H7518AA |
| Half Shaft | HNBR 1) NBR 1) | H7026AA N8369AA |
| Hose | HNBR 1) | H8024AA |
| Int Gear | HNBR 1) NBR 1) | H7315AA N8369AA |
| Pump | HNBR 1) | H8000AA |
| RP Gear | HNBR 1) | H9024AA |

1) Rubber materials have been approved by automotive customers.

Sensors

A sensor is a detection device that converts information of the operating environment into an electrical signal and outputs it to a computer, enabling conditions such as temperature, pressure, airflow, vehicle speed and so on to be monitored. Sensor providing the inanimate objects to looks like a human, has senses of touch, taste, and smell. Sensors are designed based on working condition requirements, which may include temperature, waterproof and shockproof requirements, oil and gas (gasoline or diesel), urea-resistant AdBlue, coolantresistance and so on.

GMORS has the ability to provide different rubber formulations to meet the sealing requirements of manufacturers of sensors.



| Sensor | Material | Compound |
|--------------------------|----------------|---|
| Engine | EPDM | E4000AA、E6935AA |
| | Fluorosilicone | F6004BU |
| Exhaust After-treatment | HNBR | H6915AA、H7036AA、H7500AA、H7500AB |
| Transmission | NBR | N4006AA、N5071AA、N7000AA、N7000AP、N7027AA、N7034AA、N7577AA、N9026AA、N7000AA |
| Tire Pressure Monitoring | | |
| Air Conditioning | Silicone | S5006BU、S7000AA、S7000AB、S7000AD、S7000AF、S7000AN、S7000AU、S7017AB |
| Electronic Stability | FKM | V6017AA、V7000AE、V7000AG、V7000AR、V7082AA、V7500AA、V7500AB、V7500AC、V7500AG、V7544AA、V7582AC、V8040AA、V8081AA、V8184AA、V9082AB |

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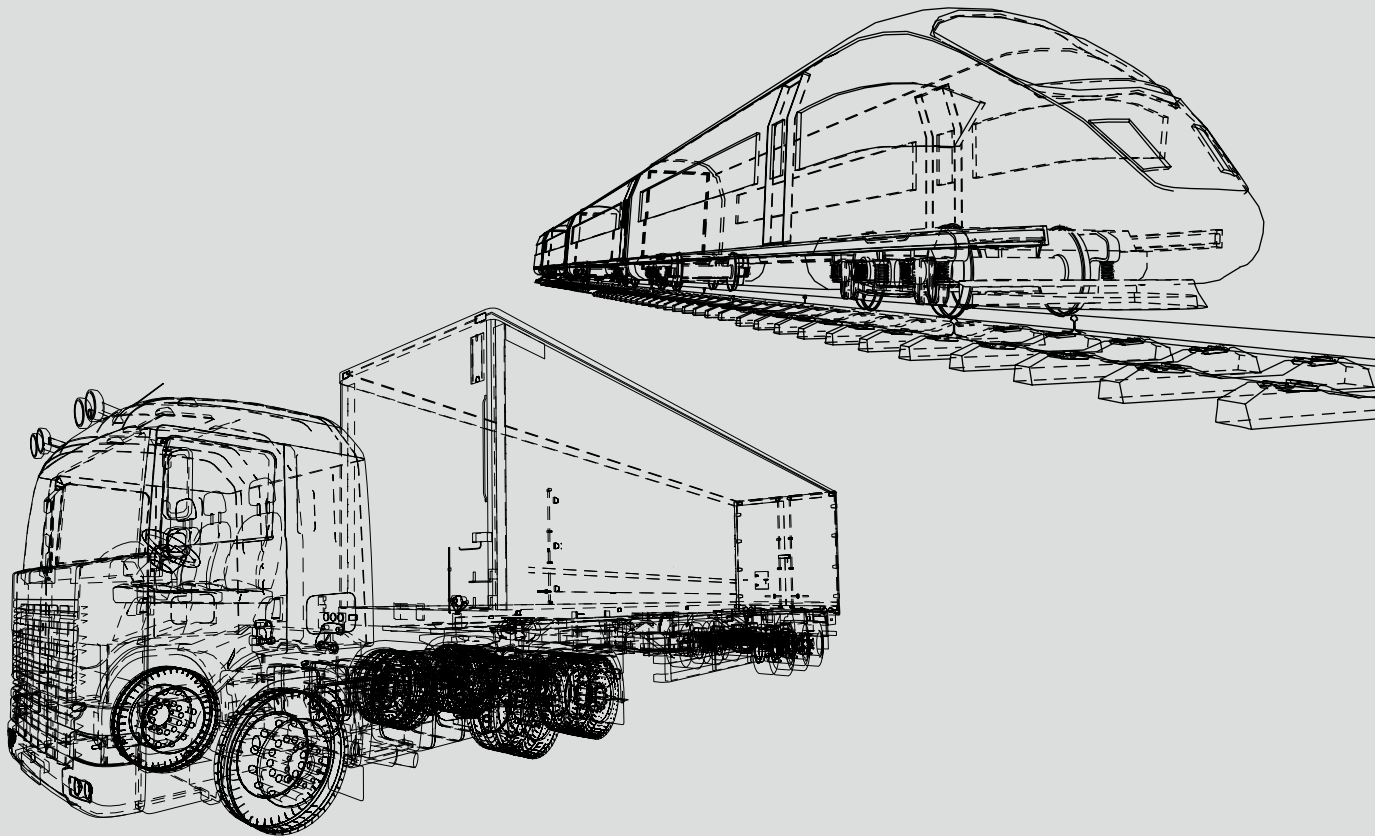
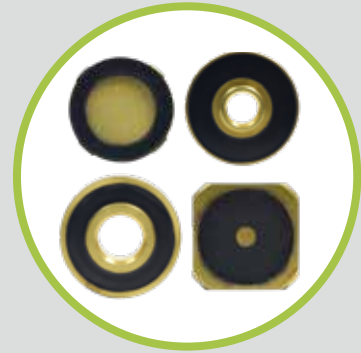
Sensor

Truck and Railway Air Brake System

Electric Vehicle System

Trucks and Railway Air Brake System

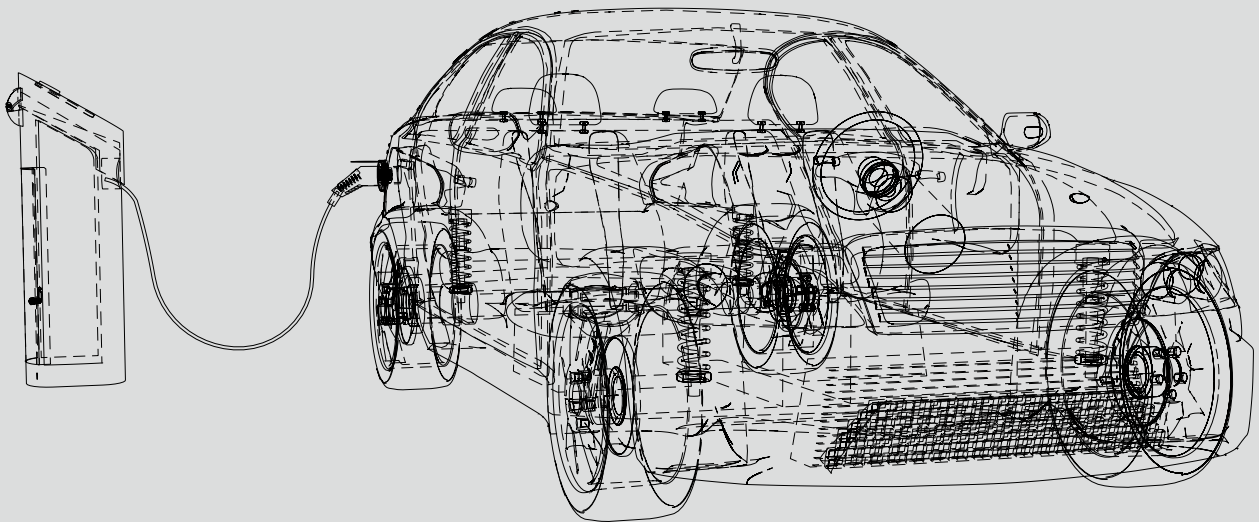
The components of an air brake system consists of an air storage tank, safety valve, low pressure indicator, a compressor, pressure governer and release valve, brake valve, relay valve, quick release valve and brake chamber. The air brake system makes use of air intake and exhaust at high pressure to generate braking efficiency for trucks and trains. The rubber material that is used is generally NBR. General product design is rubber sintered with copper. While the working environment under high pressure, GMORS Seals are designed to perform under conditions of high pressure through a process of sintering with materials like copper and fabric.



| Air Brake Systems | Material | Compound |
|-------------------|----------|----------|
| | NBR | N8088AA |

Electric Vehicle System

A sensor is a detection device that converts information of the operating environment into an electrical signal and outputs it to a computer, enabling conditions such as temperature, pressure, airflow, vehicle speed and so on to be monitored. Sensor providing the inanimate objects to looks like a human, has senses of touch, taste, and smell. Sensors are designed based on working condition requirements, which may include temperature, waterproof and shockproof requirements, oil and gas (gasoline or diesel), urea-resistant AdBlue, coolantresistance and so on. GMORS has the ability to provide different rubber formulations to meet the sealing requirements of manufacturers of sensors.



| Electric Vehicle System Components | Material | Compound |
|------------------------------------|------------------------|--|
| Battery pack application | Silicone ¹⁾ | N8088AA |
| Thermal management system | Silicone EPDM | S5556AA E4031AA、E5010AA、E6935AA、E6031AA |
| Cooling system | EPDM | E7070AI、E6002AA |
| Air conditioner fittings | EPDM | E7170AA01 |
| Temperature Sensor | Silicone | S4012AB |
| Car suspension | EPDM | E8331AA |

1) UL 94 flame ratings, V-0

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MEMO

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O-Ring Master

GMORS O-Ring Master is the completed tool for standard rubber seal sizes. When you use this APP, you don't need to have internet. In addition to O-Ring sizes, it also includes the search functions of X-Ring and Back-Up Ring.

You can also use O-Ring Housing to choose suitable O-Ring in your application.



Material Master

GMORS Material Master give you the materials recommendation for your O-Ring application, based on the working temperature and medium of working environment. We provide thousand kinds of environment condition for compatibility evaluation. In addition, GMORS provide certified rubber compounds for various international standards, such as NSF61 ,WRAS ,ACS, KTW ,W-270 ,DIN EN 549,UL 157,API 6A,NORSOK M-710,TOTAL EP PVV 142 and NACE TM0297. Please email us for further information.



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GMORS Taiwan (Headquarters)

No. 15, Kung Yeh East 4th Rd.,
Lukang, Chang Hua 505, Taiwan.
T : +886-47810288(REP.)
E : Inquiry@gmors.com

GMORS Thailand

700/889 Moo.3 Amata City Chonburi
Industrial Estate T. Nong Kakha A.
Pantong Chonburi 20160 Thailand
T : +66-38185399
E : Inquiry@gmors.co.th

GMORS Korea

1018, Galmachi-ro 314,
Jungwon-gu, Seongnam-si,
Gyeonggi-do, Republic of Korea
T : +82-316396606
E : Inquiry@gmors.co.kr

GMORS Japan

1 Chome-11-14 Honjo, Sumida City,
Tokyo 130-0004 Japan
T : +81-368032026
E : Inquiry@gmors.co.jp

GMORS Vietnam

GD4-1 in Ngoc Hoi Industrial Park,
Thanh Tri district - Hanoi city.
T : +84-02439339018
E : Inquiry@gmors.com.vn

GMORS Colombia

AK 68 #17-28, Bogota DC,
Colombia
T : + 57-3005646267
E : Inquiry@gmors.com.co

GMORS India

Unit No. 12-14 Indialand-Global
Industrial Park, Hinjawadi Phase1,
Pune - 411057, India.
T : +91-2067994400
E : Inquiry@gmors.co.in

GMORS Singapore

196, Pandan Loop #04-09
Pantech Business Hub,
Singapore 128384
T : +65-63161223
E : Inquiry@gmors.com.sg

GMORS Indonesia

Kompleks Pergudangan &
Perindustrian Era Prima Jln. Daan
Mogot KM21 No.1, Blok D11 Batu
Ceper – Tangerang, 15122
T : +62-2129518725
E : Inquiry@gmors.co.id

GMORS Peru

Calle Los Ebanistas 134 Urb.
Industrial El Artesano - Ate, Lima -Peru
T : +51-3487505
E : Inquiry@gmors.com.pe

GMORS Ecuador

Cuidadela de Guayaquil Villa 10
Mz 13, Guayas - Ecuador
T : +593-045006744
E : Inquiry@gmors.com.ec



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