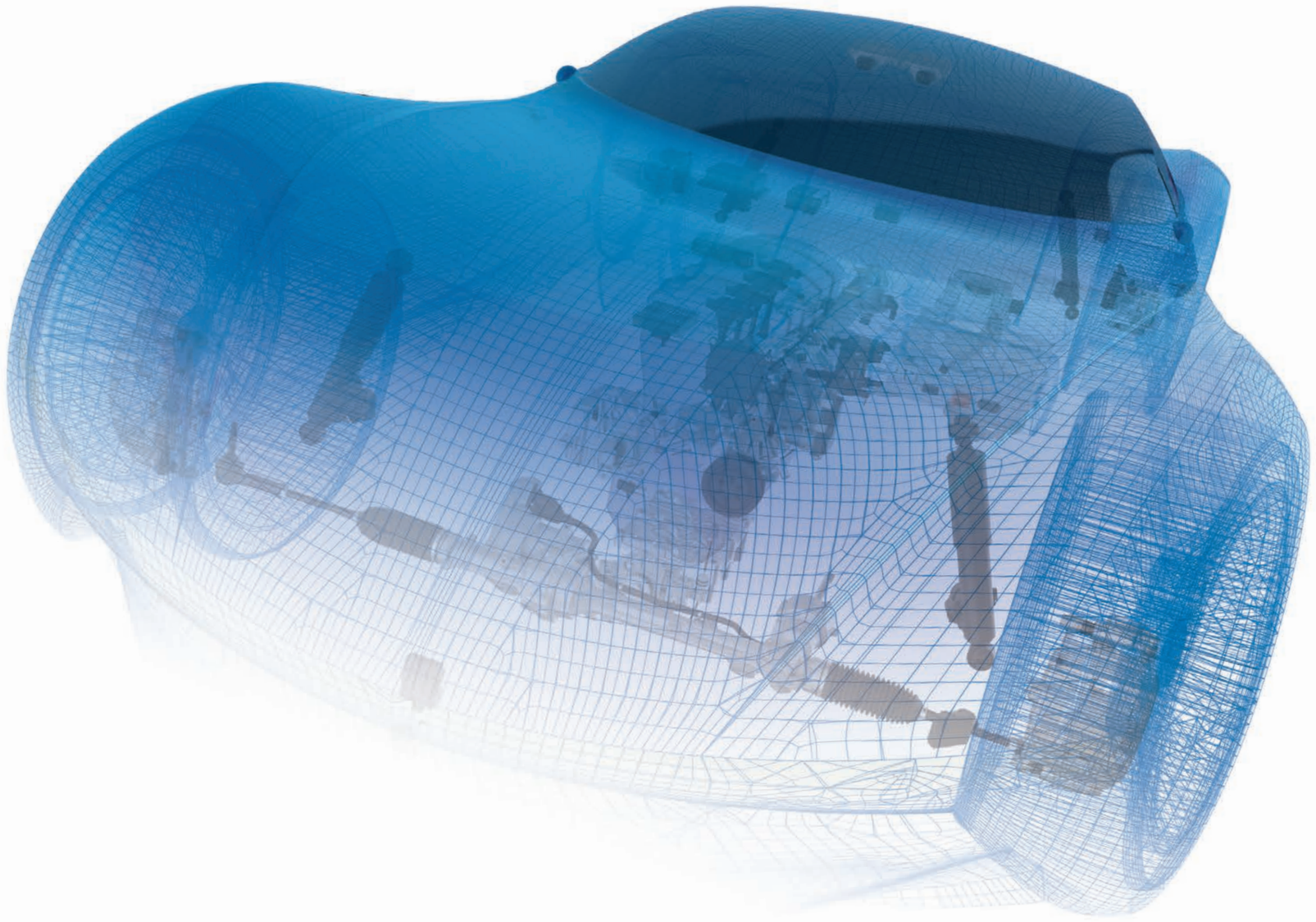
HITACHI
Inspire the Next

Product Guide



www.hitachi-automotive.co.jp/en/

Hitachi Automotive Systems, Ltd.

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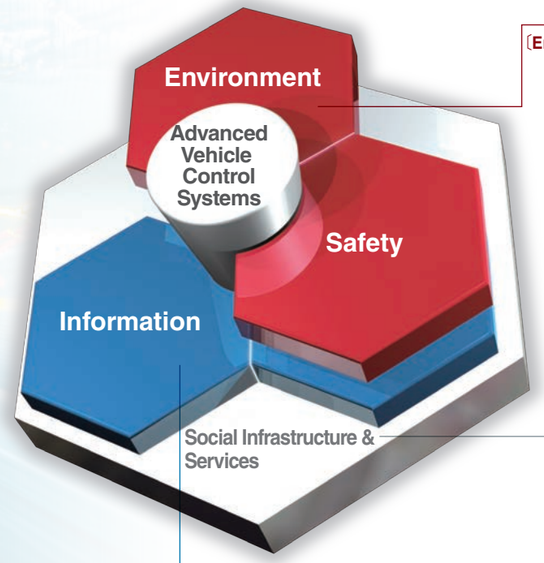
By delivering our products and system solutions throughout the world, we can realize an affluent society by creating new value for people, vehicles and society.

Future automotive technology will require substantial progress in order to preserve the global environment, eliminate accidents and decrease accident damage, and improve convenience through information technology. Vehicle electrification and increasing application of electronics will be the keys to realize a smart mobility society.

Hitachi Automotive Systems has strengths in electronics technology which will serve as a base to refine our product and system technologies in the fields of environment and safety. We are also pushing forward with our Advanced Vehicle Control System that integrates Clarion's information and safety technologies with Hitachi's social infrastructure and services. In this way, Hitachi Automotive Systems will contribute to a connected future for people, vehicles, and society.

■Our Businesses



⬢ Hitachi Automotive Systems

〔Environment Field〕 **Engine Powertrain Systems**

- Control Systems
- Exhaust Systems
- Fuel Systems
- Ignition Systems
- Engine Components and Subsystems

Electric Powertrain Systems

- Hybrid Vehicles / Electric Vehicle Systems
- Electrical Equipment Systems

〔Safety Field〕 **Integrated Vehicle Control Systems**

- Autonomous Driving Systems
- 360 Degree Sensing Systems
- Steering Systems
- Suspension Systems
- Brake Systems
- Drive Power Transmission Systems

⬢ Clarion

〔Information Field〕 **Car Information Systems**

- Integrated Human Machine Interface (HMI)
- Cloud Information Network Service

〔Safety Field〕 **Intelligent Safety Systems**

- Overhead View Monitor Camera System (SurroundEye®)
- Automatic Parking Electronic Control Unit (ECU)

⬢ Hitachi

- IoT Platform
- Artificial Intelligence (AI)
- Big Data
- Highly Reliable Infrastructure Systems
- Highly Secure Security Technologies

Moving Forward

Environment Field

Engine Powertrain Systems

In order to meet increasingly stringent environmental regulations around the world, there is a need to efficiently convert fuel into kinetic energy, and reduce emissions of gases such as CO_2. We have developed engine technologies such as direct injection and valve timing control that greatly increase the efficiency of internal combustion engines. In addition, we use simulation and analysis technologies to continually refine our components, improve engine thermal efficiency, and produce clean engines with a reduced environmental burden.

Control Systems

Control Unit for DIG

Control Unit for MPI

Control Unit for CVT

On Mission Control Unit
for CVT

Control Unit for
Four-speed Automatic Transmission

In-pan Transmission
Control Module

Exhaust Systems

Multi Function Mass
Air Flow Sensor

Airflow Sensor
(Silicon Type)

Differential Pressure Sensor

Hall Effect Type
Revolution Sensor

Pressure Sensor

Electronic Throttle Body

Electronic Throttle Body
for Diesel

Fuel Systems

High-Pressure Fuel Pump

High Voltage DIG Injector

Atomization MPI Injector

Ignition Systems

Plug Top Coil

Engine Components and Subsystems

Piston for DIG

Piston for MPI

Cooling Channel
Piston

Valve Timing Control
System (VTC)

VTC Solenoid Valve

Electromotive VTC

Variable Valve Event and Lift
(VEL)

Variable Displacement Vane Pump
(Front Cover Integrated Type)

Variable Displacement
Vane Pump
(Chain Drive Type)

Water Pump
(Single Bearing Type)

Water Pump

Balancer
(Oil Pan & Oil Pump Integrated Type)

Balancer
(VDVP Integrated Type)

Chain Case Module
(Oil Pump & Water Pump Integrated Type)

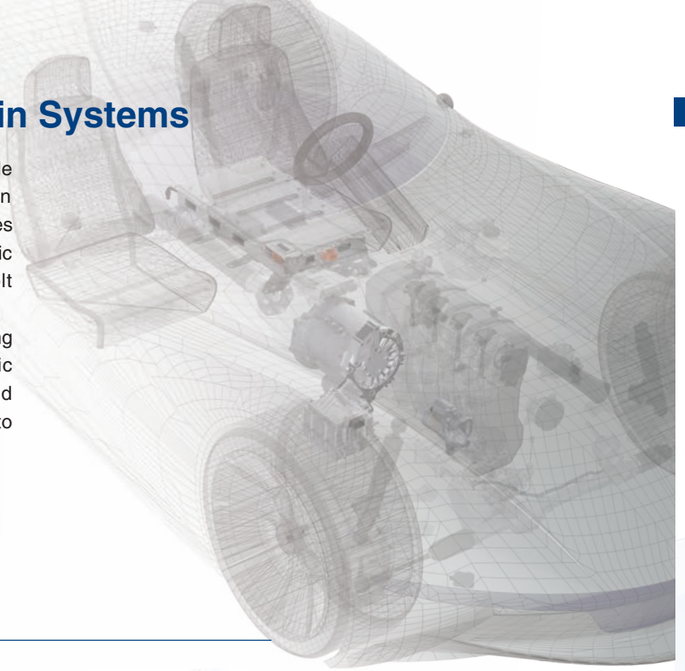
Water Pump
(with Housing Type)

CVT: Continuously Variable Transmission
DIG: Direct Injection Gasoline
MPI: Multi Point Injection
VEL: Variable valve Event and Lift
VDVP: Variable Displacement Vane Pump
VTC: Valve Timing Control

Environment Field

Electric Powertrain Systems

In recent years, vehicle electrification has seen remarkable progress, due in part to environmental regulations on zero-emission vehicles. In addition to Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV), and Electric Vehicles (EV), Mild Hybrid Vehicle systems using 48 Volt electricity are starting to appear.
Vehicle electrification systems will prove essential for meeting environmental regulations. In addition to the main electric powertrain components of electric motors, inverters, and lithium-ion batteries, we are developing other technologies to maximize eco-friendliness and driving performance.



Hybrid Vehicles / Electric Vehicle Systems

Motor for HEV

Inverter for HEV / PHEV / EV

Inverter for HEV / PHEV / EV

Lithium-ion Battery

Lithium-ion Battery

Lithium-ion Battery

Battery Control Unit

Electrical Equipment Systems

Planetary Gear
Reduction Starter

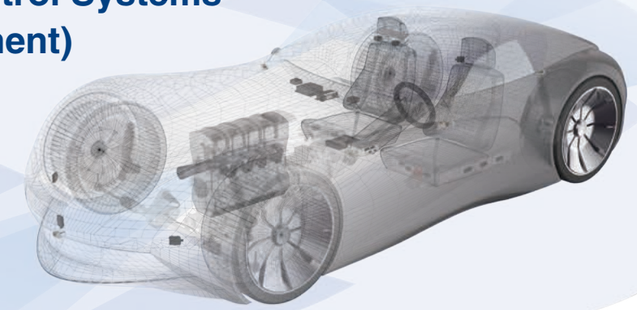
Twin Axial Gear
Reduction Starter

EV: Electric Vehicle
HEV: Hybrid Electric Vehicle
PHEV: Plug-in Hybrid Electric Vehicle

Safety Field

Integrated Vehicle Control Systems (Recognition & Judgment)

Expectations are increasing for safe, comfortable, and highly efficient autonomous driving systems that can eliminate accidents, reduce driver workload, and resolve traffic congestion, thereby helping to achieve a smart mobility society.
In order to realize a safe and secure autonomous driving system, we are developing a 360 degree sensor fusion system that can detect the surrounding situation by integrating sensor data from sources such as stereo cameras and radars.
Data from this system is used by our autonomous driving ECU to make instantaneous decisions on acceleration, deceleration, and lane-changing.



Autonomous Driving Systems / 360 Degree Sensing Systems

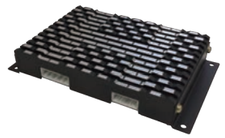
Stereo Camera

Mega Pixel Camera
(Clarion)

Millimeter-wave Radar
(Mid-range)

Millimeter-wave Radar
(Long-range)

Advanced Driver Assistance System
(ADAS) Control Unit

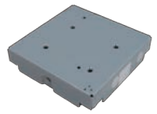


AD ECU
(Prototype)

Central Gateway

Map Positioning Unit
(Prototype)

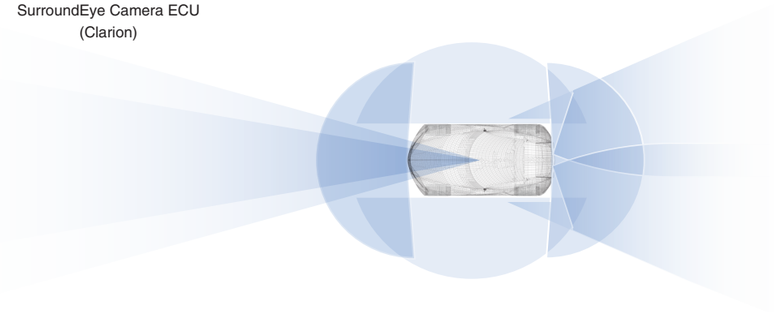
Telematics Control Unit



SurroundEye Camera ECU
(Clarion)

SurroundEye®
(SurroundEye and
Rear Camera Display Example)

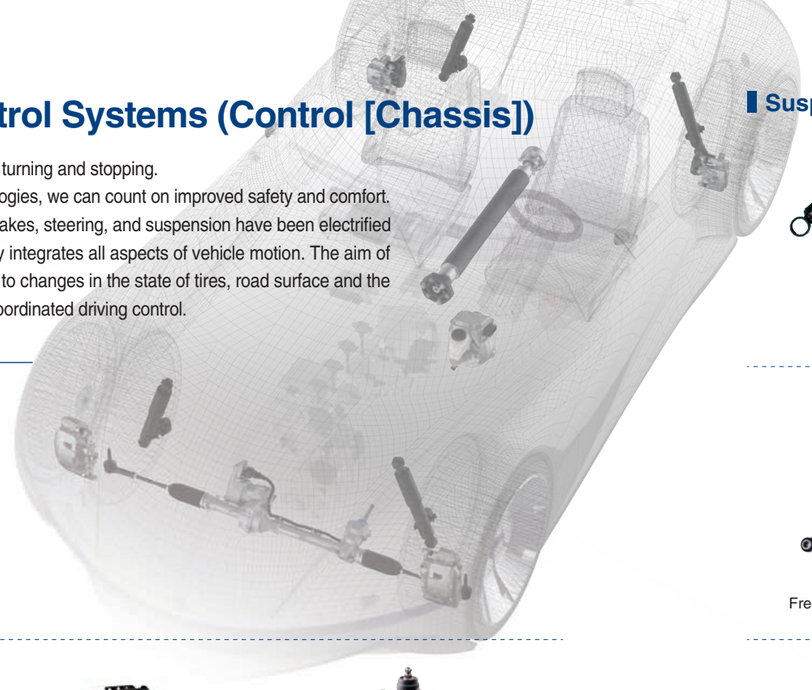
AD: Autonomous Driving
ADAS: Advanced Driver Assistance System
ECU: Electronic Control Unit



Safety Field

Integrated Vehicle Control Systems (Control [Chassis])

Chassis products determine the basic functions of automobiles - moving, turning and stopping.
By coordinating and harmonizing the chassis with various control technologies, we can count on improved safety and comfort.
In order to aim for an even higher level of safety, the core elements of brakes, steering, and suspension have been electrified and subjected to electronic control. We created a system that completely integrates all aspects of vehicle motion. The aim of this system is to improve motion performance by responding in real-time to changes in the state of tires, road surface and the vehicle itself, as well as to achieve autonomous driving, which requires coordinated driving control.



Steering Systems

Electric Power Steering System
(Belt Drive Rack Assist Type)

Electric Power Steering System
(Pinion Assist Type)

Manual Steering Gear
for Column Assist EPS

Rack & Pinion Power Steering Gear
(Speed Sensitive Type)

Electric Power Steering Control Unit
(Column Assist Type)

Integral Power Steering Gear

Power Steering Pump
(Variable Displacement Type)

Variable Displacement Power Steering
Pump for Heavy-duty Truck

Power Steering Pump
(F-Type)

Power Steering Pump
(CP1-Type)

Drive Power Transmission Systems (Propeller Shaft)

Impact Absorbable CVJ Type

Direct Connection Interface (DCI) Joint Type

Rubber Coupling Type (with Lobro Joint)

CFPR Tube Type

Aluminum Tube Type

CFRP: Carbon Fiber Reinforced Plastics
EPS: Electric Power Steering

Suspension Systems

Shock Absorber

Suspension Strut

Suspension Unit

Mono Tube Shock Absorber

Frequency Reactive Damper

Hydraulic Type Height Adjustment
Suspension System

Air Suspension Strut

Semi-Active Suspension System

Hydraulic Cylinder
for Controlling Vehicle Roll

Hydraulic Cylinder
for Roll Control

Self Levelizer

Air Levelizer

Air Compressor
for Height Adjustment

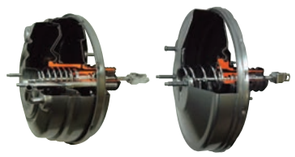
Brake Systems

Disc Brake Caliper

Disc Brake Caliper
for Motorcycle

Electric Parking Brake

Brake Master Cylinder



Vacuum Booster

Electrically-Driven
Intelligent Brake

Control Unit for Other Purposes

Anti-Lock Brake System

Electronic Stability Control
(ESC)

Electric 4WD
Control Unit

Aftermarket Products / Applied Technology & Industrial Equipment

Over many years, Hitachi Automotive Systems has developed and cultivated advanced automotive technologies that have extensive secondary applications in the world around us. For instance, from our manufacturing technologies, we have derived anti-vibration and hydraulic components, home appliance technologies that support modern lifestyles, and industrial equipment and social infrastructure including railcar components, anti-seismic products, and many other useful technologies. Moving forward, we will continue to pursue secondary applications for our technologies in order to realize a more comfortable society.

Aftermarket Products & Maintenance Accessories

Brake Pads

Brake Rotor

Shock Absorber

Power Steering Gear

Power Steering Pump

Water Pump

Fuel Pump

Starter

Electronic Throttle Body

Air Flow Sensor

Ignition Coil

Hitachi Diagnostic Monitors

Ignition Coil Checker

Tire Pressure Monitoring System

Applied Technology & Industrial Machinery

Railcar Components

Vertical Damper

Horizontal Damper

Yaw Damper

Yaw Damper between the Car

Gas Springs

Variable Damper System

Leveling Valve

Gas Springs / Gas Springs for Laundry Machine

Gas Springs for Industrial Equipment

Anti-seismic & Anti-vibration Products for Buildings & Bridges

Seismic Isolation Oil Dampers

Anti-vibration Oil Dampers

ATSUGI Hydraulic Press

Vibration-proof Damper for Housing

Toggle Type Vibration-proof Damper for Building Antiseismic Reinforcement