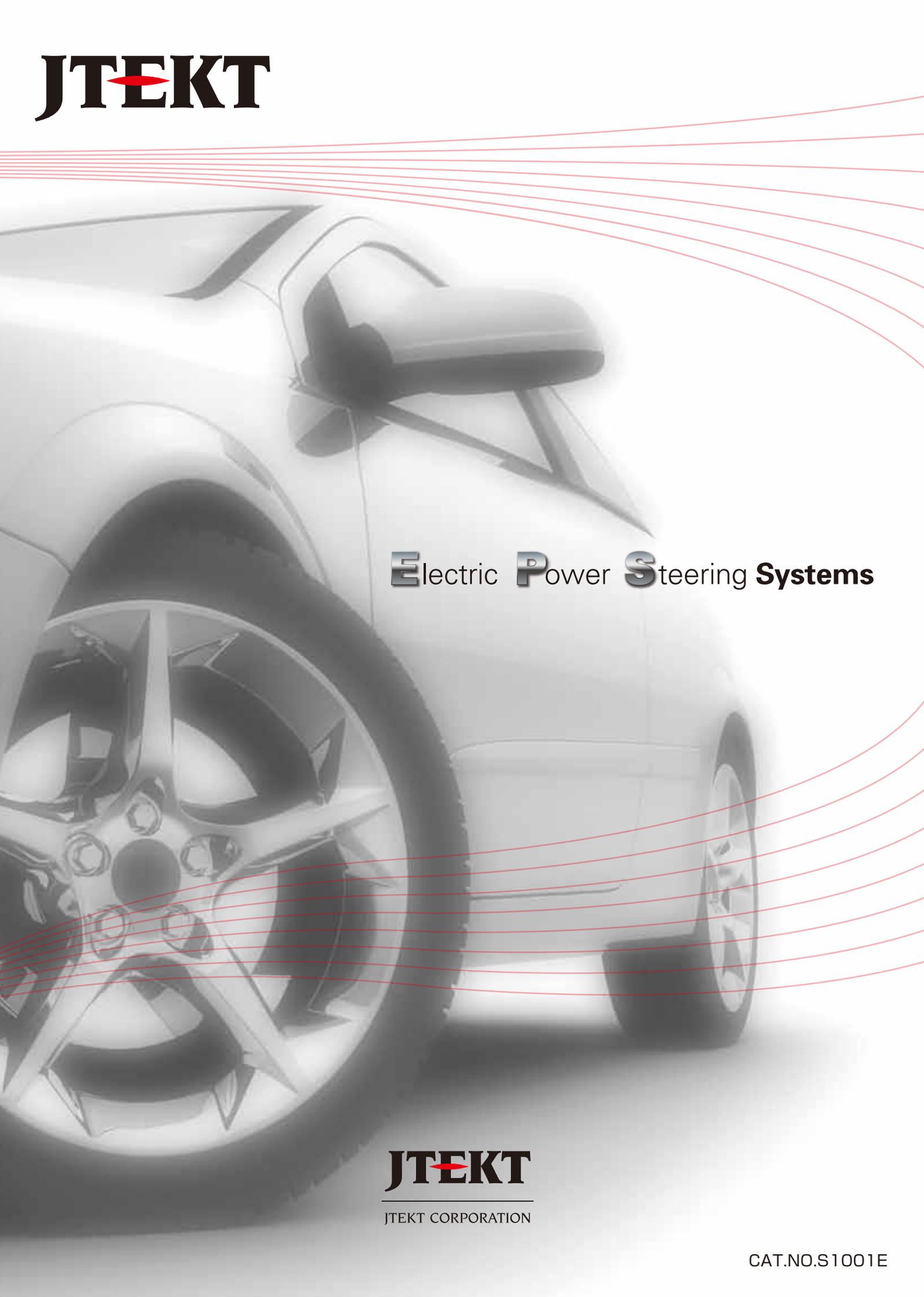


# JTEKT



**E**lectric **P**ower **S**teering **Systems**

# JTEKT

JTEKT CORPORATION

CAT.NO.S1001E



**Our goal is sensational driving experiences – JTEKT  
A Feeling of Unity between Driver and Car,  
and Steering Feel That Stimulates the Senses...**

"Driving," "Cornering" and "Stopping."

Of the three basic vehicle performance functions, our forte is "Cornering."

Committed to producing superior steering equipment,

JTEKT developed the world's first electric power steering (EPS) system in 1998.

Today, our products hold No. 1 market share around the globe.

**E**lectric **P**ower **S**teering **S**ystems

Reliability backed by  
experience

**SAFETY**

Immeasurable  
sensitivity  
and technologies

**COMFORT**

Energy-saving  
upon request  
with the times

**ECOLOGY**

**JTEKT responds to  
market demand in  
support of a  
vehicle society of  
tomorrow as a  
steering system supplier.**

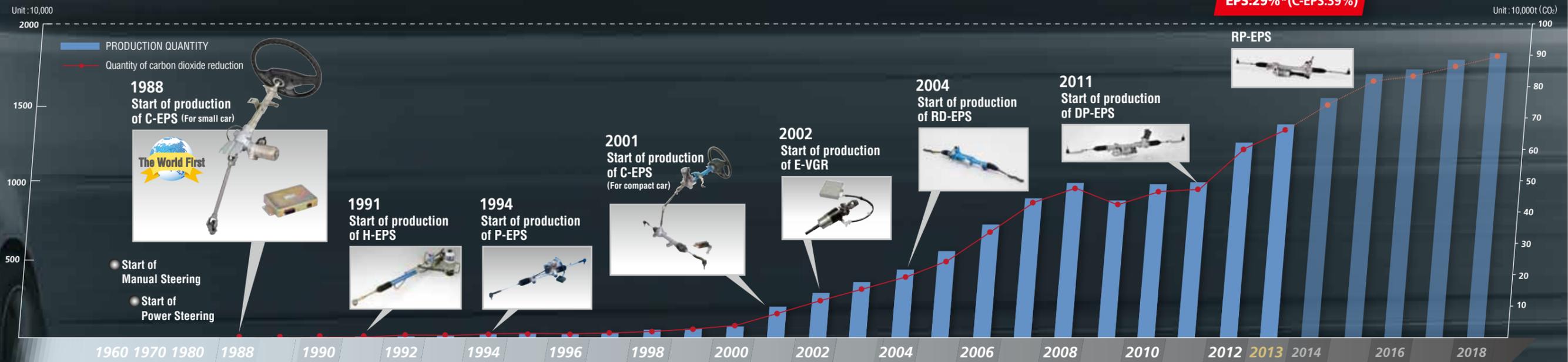


Safety, Comfort & Ecology

Reliability backed by experience, immeasurable sensibility and technologies, and energy-saving features in tune with the times

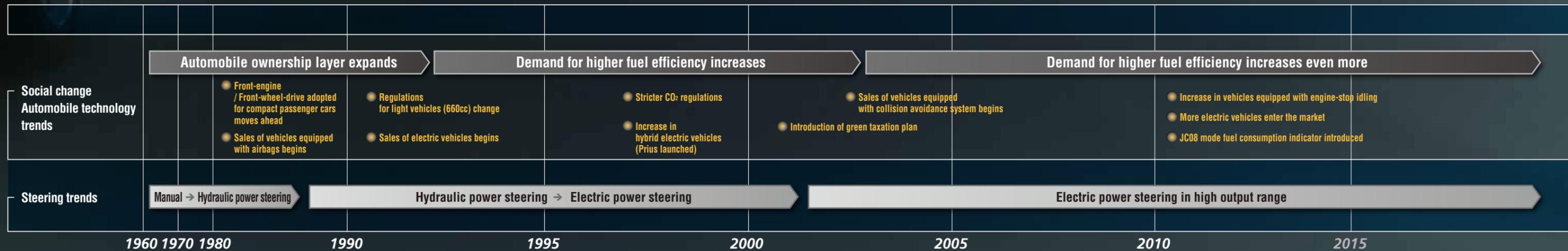
## Proudly No.1 in the Global Market One in three vehicles is equipped with JTEKT electric power steering (EPS)

**Share No.1**  
EPS:29%\*(C-EPS:39%)



EPS start of production overseas

- 1998 Europe
- 2001 North America
- 2007 China / Thailand
- 2009 India
- 2011 Indonesia



## Proposal of optimal electric power steering (EPS) system considering safety, comfort and ecology

As the world's No. 1 contributor to the environment,\* JTEKT a comprehensive steering systems manufacturer committed to providing optimal systems that match vehicle use/purpose by ensuring products are well-balanced in all areas; from quality, cost and delivery to safety, comfort and ecology.

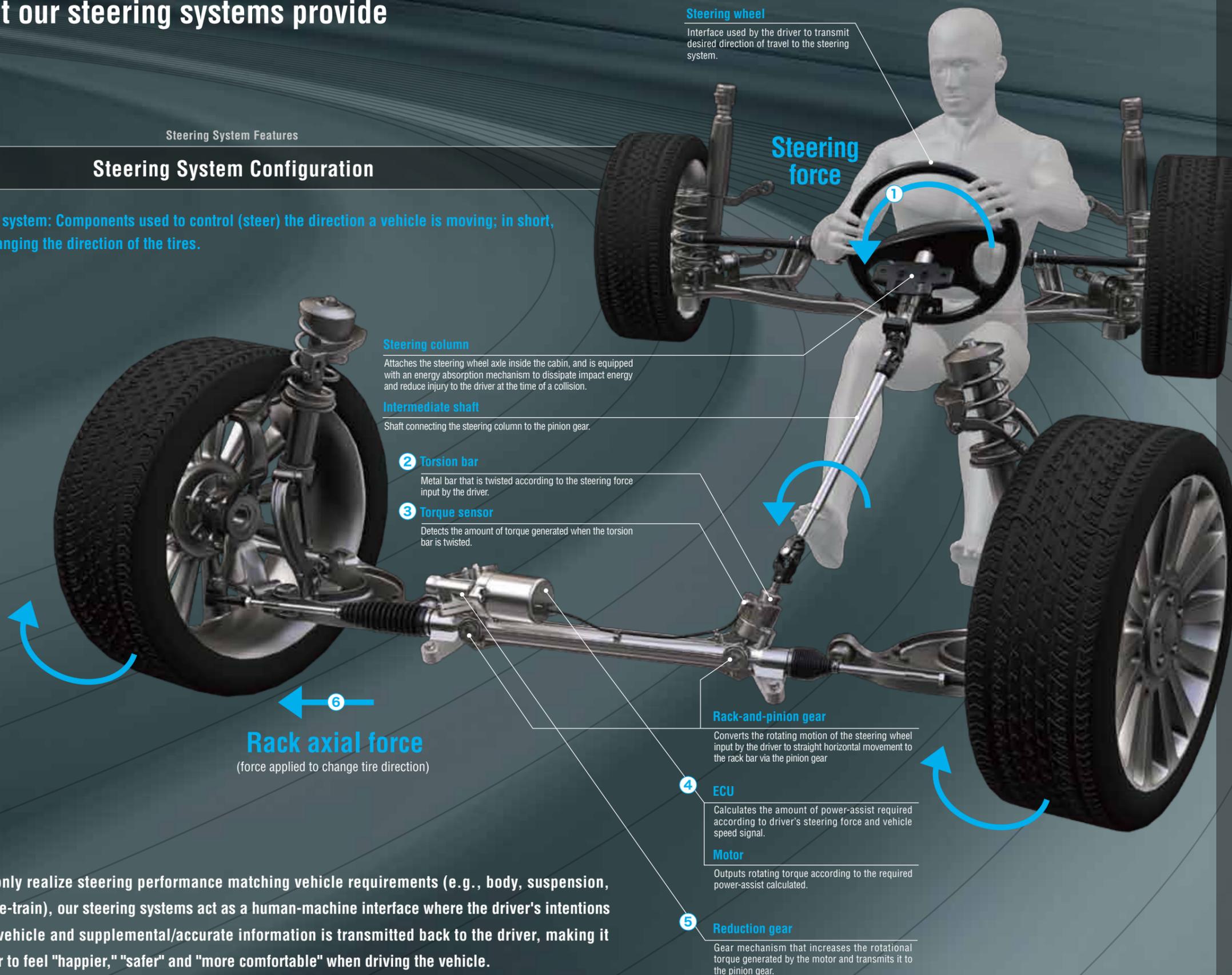
\* JTEKT is world No. 1 in contributing to the environment. Our EPS systems have top market share, offer superior fuel efficiency and contribute to environmental conservation to the highest degree. We are also working to improve the environmental efficiency of conventional hydraulic power steering systems.

# A Confident, Relaxing Driving Experience... That's what our steering systems provide

Steering System Features

## Steering System Configuration

Definition of steering system: Components used to control (steer) the direction a vehicle is moving; in short, the equipment for changing the direction of the tires.



### Steering wheel

Interface used by the driver to transmit desired direction of travel to the steering system.

Steering force

### Steering column

Attaches the steering wheel axle inside the cabin, and is equipped with an energy absorption mechanism to dissipate impact energy and reduce injury to the driver at the time of a collision.

### Intermediate shaft

Shaft connecting the steering column to the pinion gear.

### 2 Torsion bar

Metal bar that is twisted according to the steering force input by the driver.

### 3 Torque sensor

Detects the amount of torque generated when the torsion bar is twisted.

### Rack-and-pinion gear

Converts the rotating motion of the steering wheel input by the driver to straight horizontal movement to the rack bar via the pinion gear

### 4 ECU

Calculates the amount of power-assist required according to driver's steering force and vehicle speed signal.

### Motor

Outputs rotating torque according to the required power-assist calculated.

### 5 Reduction gear

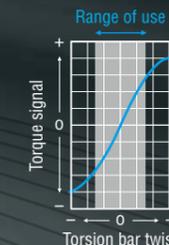
Gear mechanism that increases the rotational torque generated by the motor and transmits it to the pinion gear.

Rack axial force  
(force applied to change tire direction)

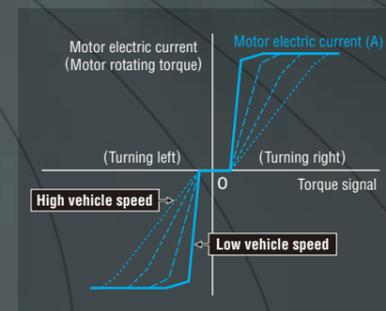
JTEKT products not only realize steering performance matching vehicle requirements (e.g., body, suspension, tires, brakes and drive-train), our steering systems act as a human-machine interface where the driver's intentions are delivered to the vehicle and supplemental/accurate information is transmitted back to the driver, making it possible for the driver to feel "happier," "safer" and "more comfortable" when driving the vehicle.

## Basic steering operation

- 1 Steering wheel is turned.
- 2 The force input to the steering wheel (torque) twists the torsion bar.
- 3 Torsion bar twisting is detected as a torque signal by the torque sensor and input into the ECU.

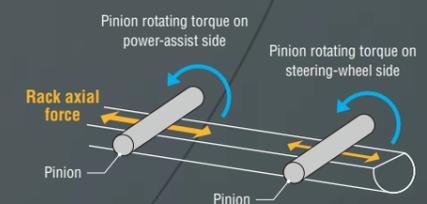


- 4 ECU adds electric current to the motor based on torque signal and vehicle speed.



- 5 Motor rotating torque is increased by the reduction gear and transmitted to the pinion.

- 6 Pinion rotating torque (supplemental steering torque) on the power-assist side and pinion rotating torque (steering rotating torque) on the steering-wheel side are converted to rack axial force to change tire direction.



# JTEKT Steering Systems

## Standard System Proposal

Rack force (kN)		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Vehicle segment		UA/A			B		C		D		E		F		SUV/P-UP				
Vehicle segment		UA/A	B	C	D	E	F	SUV/P-UP											
Vehicle segment																			
Steering system	Column-assist	C-EPS																	
	Rack-assist	P-EPS DP-EPS RP-EPS RD-EPS H-EPS																	
Application range		C-EPS					P-EPS, DP-EPS, RP-EPS, RD-EPS, H-EPS												
Application range		C-EPS					P-EPS, DP-EPS, RP-EPS, RD-EPS, H-EPS												

JTEKT EPS systems are compatible for most automobiles, from small vehicles to large SUVs

## System Features by Type

### Column-assist

Since the motor and ECU are inside the cabin, waterproofing is not required and there is no influence on engine and transmission layout.



Optimum steering system for compact vehicles with small rack force

### Rack-assist

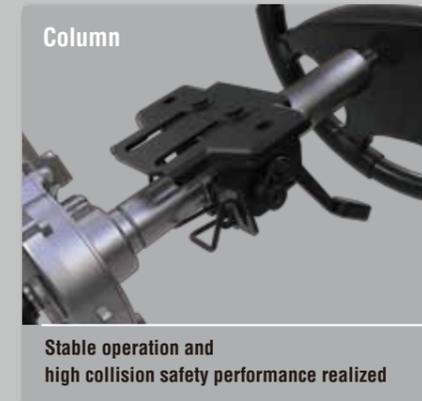
Excellent steering performance as the result of minimal friction between the time of turning the steering wheel and start of rack movement.



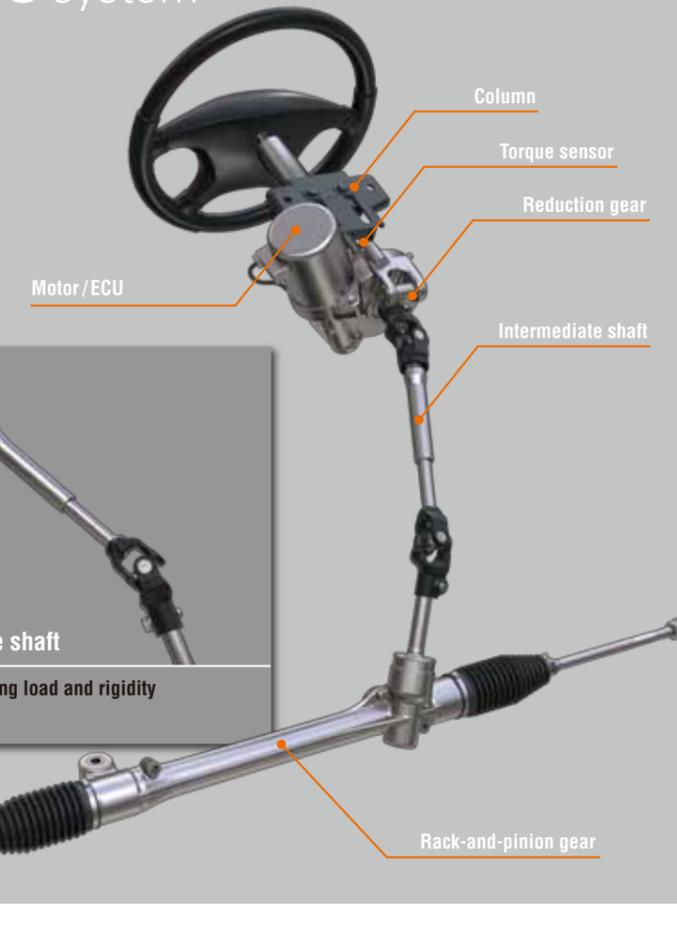
Optimum steering system for medium- to large-sized vehicles that require better steering performance

# C-EPS

- Ideal for compact vehicles with small engine compartment: power-assist unit is located in the steering column
- Introduced as the world's first EPS in 1988
- Superior safety, comfort and environmental performance based on technologies and experience accumulated since its introduction



## C-EPS system

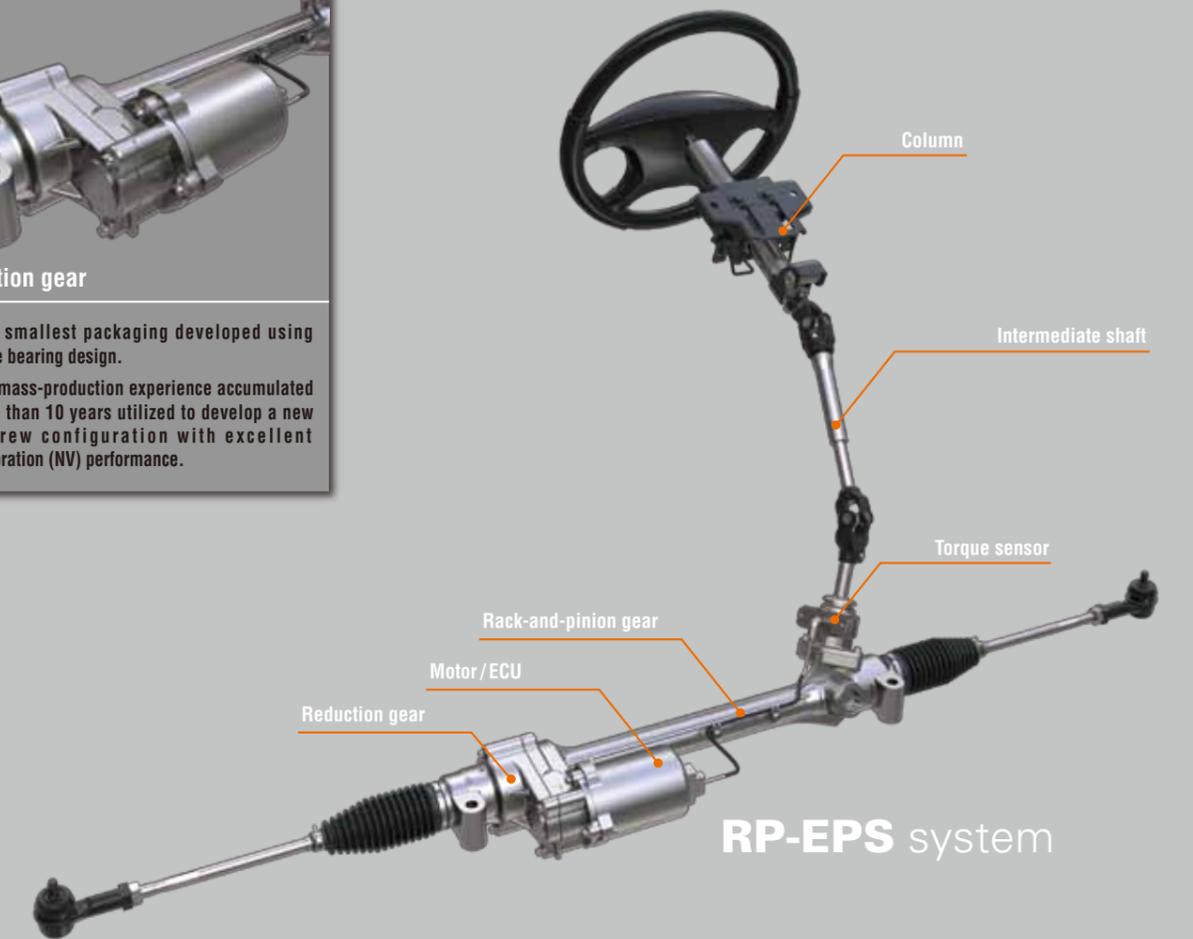
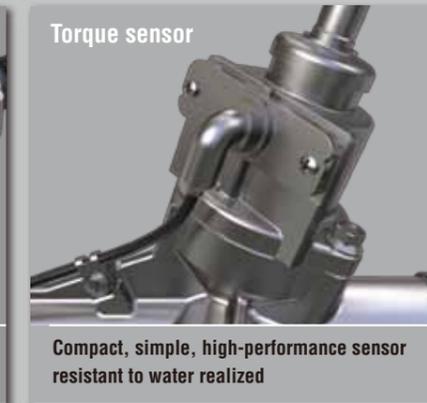
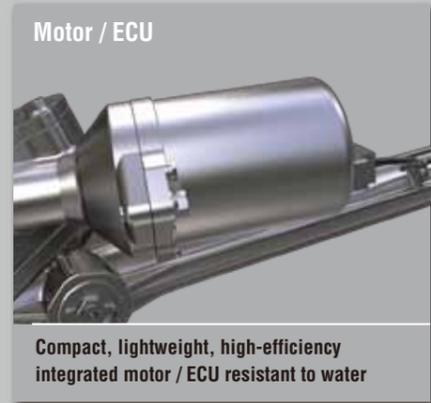
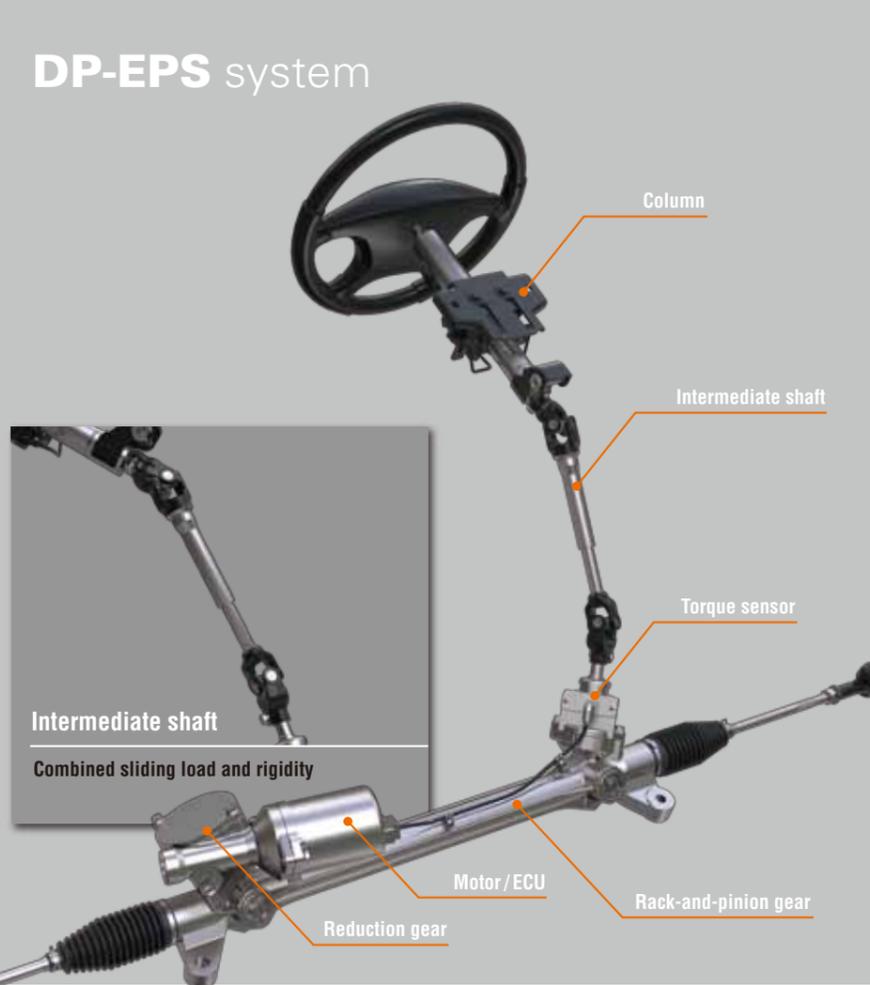
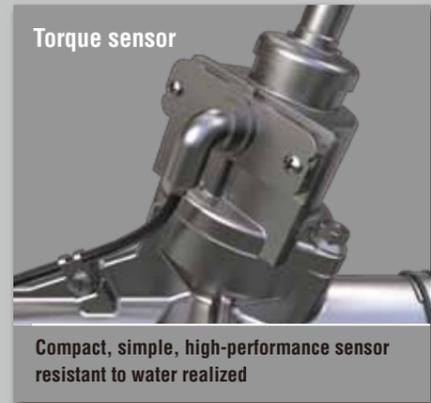


# DP-EPS

- Rack-assist realizes excellent steering feel with high rigidity and superior dynamic performance.
- System structure with flexible mounting freedom realized by separating the assist unit from the steering wheel axle.
- Enhanced degree of freedom in specific stroke on the steering-wheel side realized by adopting an optimal design to reinforce the assist unit.
- System with excellent safety, comfort and environmental performance realized through the application of proven technologies.

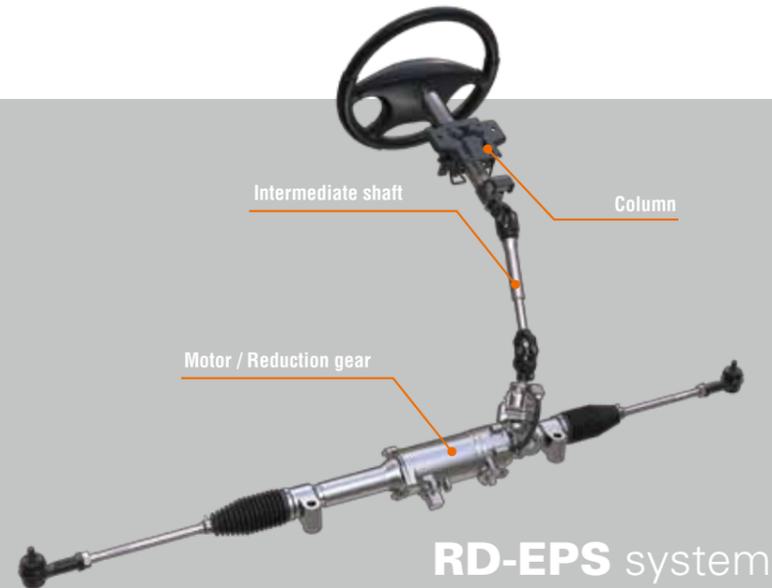
# RP-EPS

- Rack-assist realizes excellent steering feel with high rigidity and superior dynamic performance.
- Easier installation realized with adoption of high-output, compact reduction gear.
- System with excellent safety, comfort and environmental performance realized through the application of proven technologies.



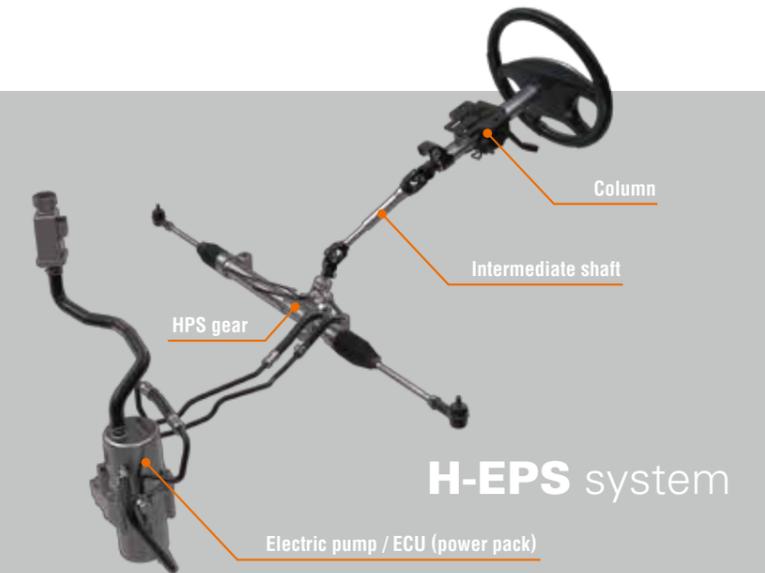
# RD-EPS

- Rack-assist realizes superior direct-response steering feel.
- Superior energy-saving system has less reduction gear loss and high machine efficiency.
- System with excellent safety, comfort and environmental performance realized through the application of proven technologies.



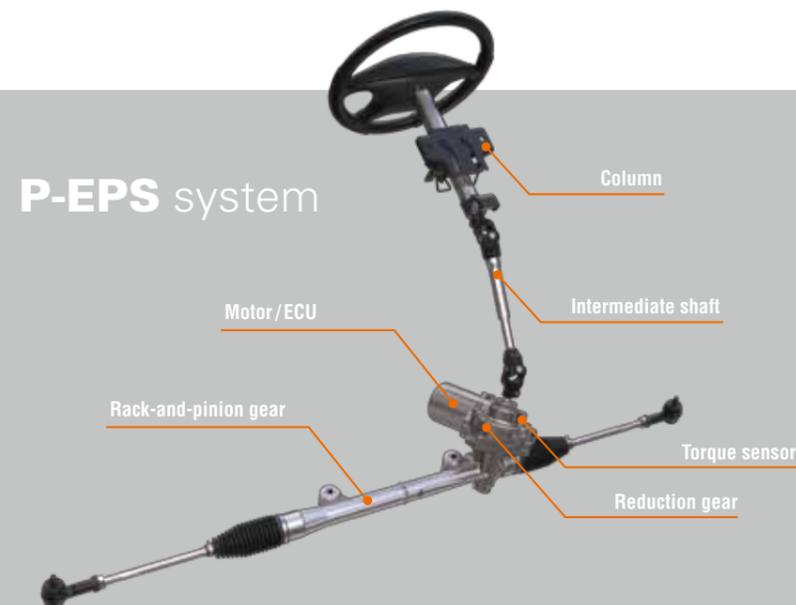
# H-EPS

- Excellent safety, comfort and environmental performance realized using an energy-saving hydraulic power steering system equipped with an electric pump.
  - Extremely flexible installation and ability to use for EV driving realized by adopting an independent electric pump.
  - Excellent steering feel and improved fuel efficiency realized through optimum discharge setting (MAP) and special valve tuning.



# P-EPS

- Rack-assist realizes excellent steering feel with high rigidity and superior dynamic performance.
- Small/compact system adopted in response the engine room environment.
- System with excellent safety, comfort and environmental performance realized through the application of proven technologies.

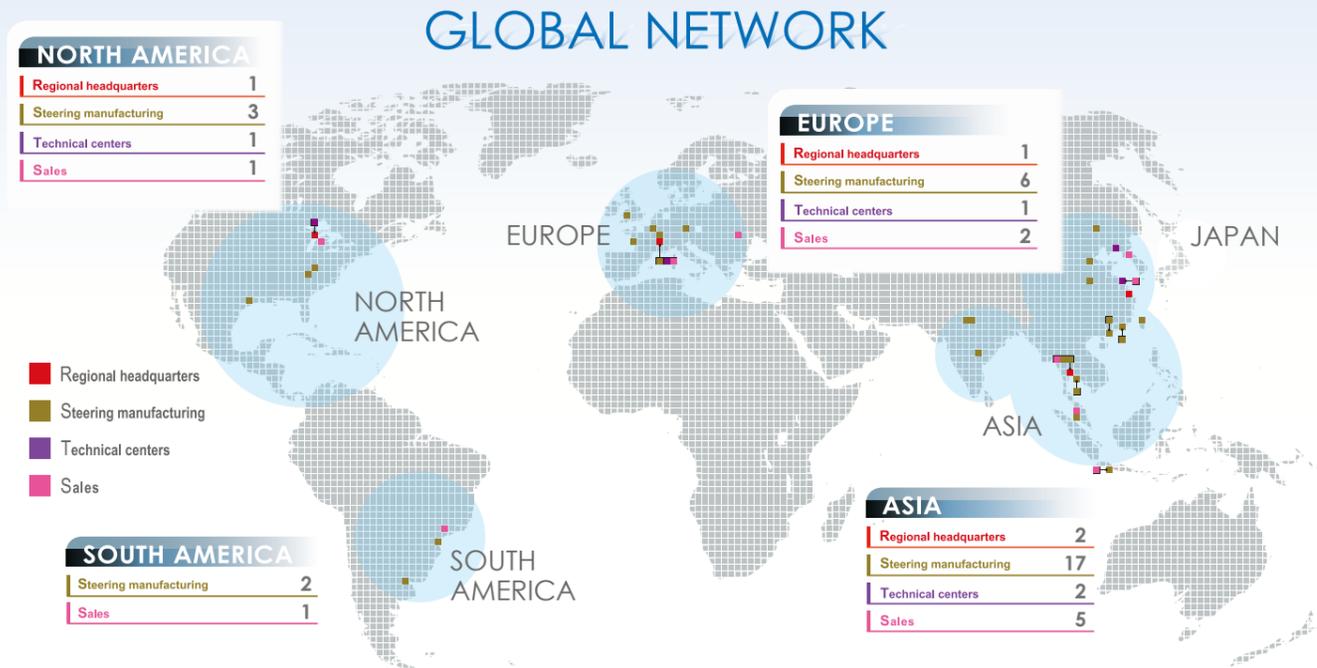


# E-VGR

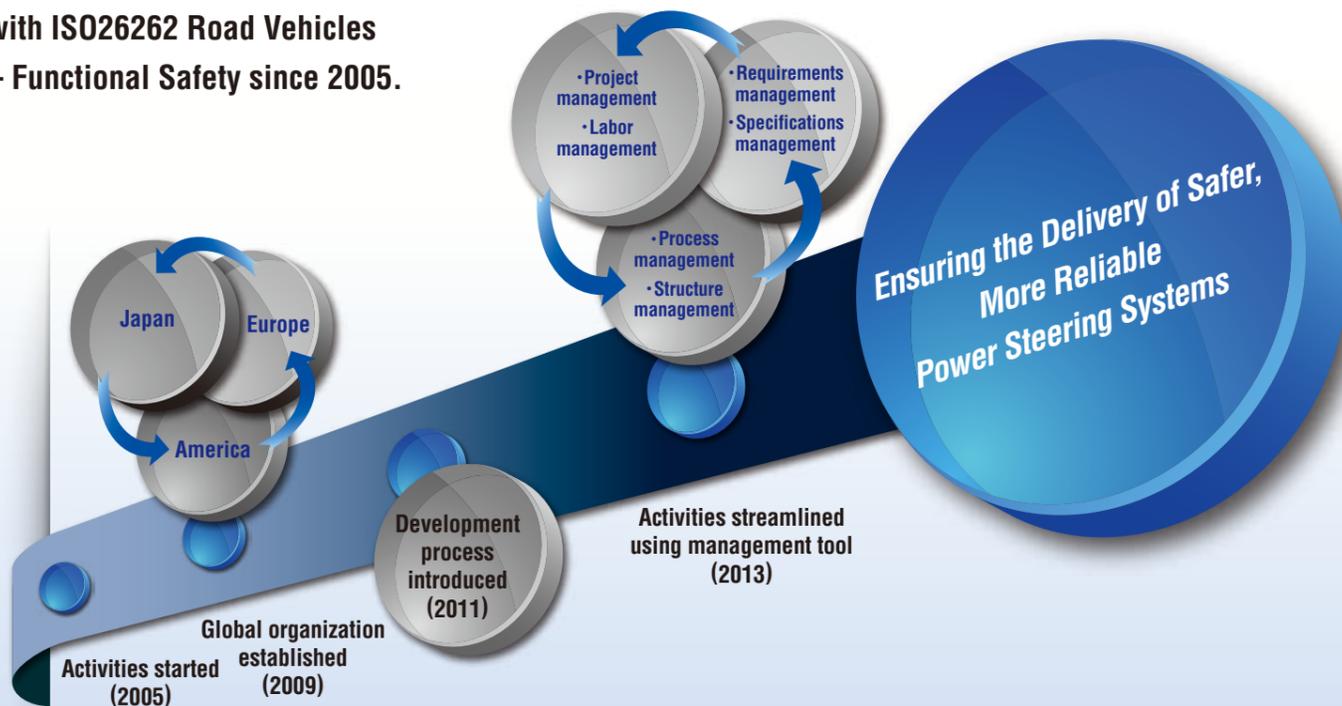
- Variable steering-angle ratio system combining vehicle stability and steering performance.
- Steering performance improved by increasing steering angle ratio at low speed.
- Straight-line driving stability improved by decreasing steering-angle ratio at high speed.
- Vehicle stability improved by activating low-friction moment, etc.



# Safer, More Reliable Power Steering Systems to Customers Worldwide

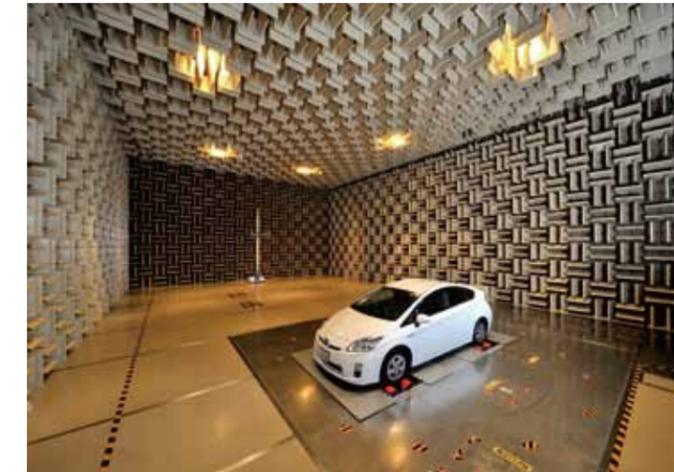


JTEKT has been conducting activities to ensure compliance with functional safety standards in accordance with ISO26262 Road Vehicles – Functional Safety since 2005.



## Advanced Research & Development Facilities for Producing Next-generation EPS Systems

JTEKT R&D centers exchange information around the world, enabling the company to accurately understand market demand and provide the newest/best/optimal systems to meet the diversified needs of our customers.



Electromagnetic Anechoic Chamber



X-Ray CT Scanner



Driving simulator



Vehicle evaluation in cold regions



Design backed by analytical data



Steering Column Impact Testing Apparatus



Power Steering System Energy Consumption Measuring Apparatus

## Iga Proving Ground Enables Testing / Evaluations Simulating Roads Worldwide

Fully utilizing our knowledge as a world-leading systems supplier, JTEKT conducts driving evaluations and analyses of products installed in vehicles. We exhaustively pursue the highest standards in product safety and operation on a test course capable of simulating various road and weather conditions around the world. As a total systems supplier, our highest value is to provide our customers with products that deliver outstanding performance and the best quality that help to make automobiles that are more than just fun to drive.

**JTEKT Iga Proving Ground**

- Site area: 500,000m<sup>2</sup>
- Course area: 170,000m<sup>2</sup>
- Combined circuit length: 2,200m
- Dynamics pad area: 54,000m<sup>2</sup>

**Test Courses:**

- A** Straight-line Course
- B** Winding Course
- C** Administration / Maintenance Building
- D** Forging Course
- E** Dynamics Pad
- F** Noise Evaluation Course

## OFFICES

### JTEKT CORPORATION OF U.S.A.

#### -Cleveland Office-

29570 Clemens Road, P.O.Box 45028, Westlake,  
OH 44145, U.S.A.  
TEL : 1-440-835-1000  
FAX : 1-440-835-9347

#### -Detroit Office-

47771 Halyard Drive, Plymouth, MI 48170, U.S.A.  
TEL : 1-734-454-1500  
FAX : 1-734-454-4076

### JTEKT NORTH AMERICA CORPORATION

47771 Halyard Drive, Plymouth, MI 48170, U.S.A.  
TEL : 1-734-454-1500  
FAX : 1-734-454-7059

### JTEKT AUTOMOTIVE NORTH AMERICA INC.

47771 Halyard Drive, Plymouth, MI 48170, U.S.A.  
TEL : 1-734-454-1500  
FAX : 1-734-454-7059

### KOYO MEXICANA, S.A. DE C.V.

Av. Insurgentes Sur 2376-505, Col. Chimalistac,  
C.P. 01070, Del. Álvaro Obregón, México, D.F. MEXICO  
TEL : 52-55-5207-3860  
FAX : 52-55-5207-3873

### KOYO ROLAMENTOS DO BRASIL LTDA.

Av. Reboucas 2472 Jardim America, Sao Paulo-SP, BRASIL  
TEL : 55-11-3372-7500  
FAX : 55-11-3887-3039

### JTEKT (THAILAND) CO., LTD.

172/1 Moo 12 Tambol Bangwua, Amphur Bangpakong,  
Chachoengsao, 24180, THAILAND  
TEL : 66-38-533-310~7  
FAX : 66-38-532-776

### JTEKT AUTOMOTIVE (THAILAND) CO., LTD.

107 Moo 4 T.Pluakdaeng A.Pluakdaeng Rayong 21140,  
THAILAND  
TEL : 66-38-954320  
FAX : 66-38-954321

### PT. JTEKT INDONESIA

Surya Cipta City of Industry Jalan Surya Madya Kav.I-27B  
Karawang 41363, INDONESIA  
TEL : 62-267-8610-270  
FAX : 62-267-8610-271

### JTEKT MALAYSIA SDN. BHD.

No.8, Jalan Palam 34/18A, Taman Perindustrian Pak Chun,  
Seksyen 34 40470 Shah Alam. Selangor, MALAYSIA

### JTEKT KOREA CO., LTD. Seoul Head Office

Inwoo Building 6F, 539-11 Shinsa-Dong, Kangnam-Ku,  
Seoul, KOREA  
TEL : 82-2-549-7922  
FAX : 82-2-549-7923

### TAIWAN JTEKT CO.,LTD.

NO.23,Guangfu N.Road, Hukou Township,Hsinchu,  
Country 303,TAIWAN  
TEL : 886-3-597-2453  
FAX : 886-3-597-4687

### JTEKT (CHINA) CO., LTD. Shanghai Branch

Room 25A2, V-Capital Building.333 Xianxia Road,  
Changning District, Shanghai CHINA  
TEL : 86-21-5178-1000  
FAX : 86-21-5178-1008

### JTEKT (CHINA) CO., LTD. Beijing Branch

Room 1012, Fortune Building, No.5 Dong San  
Huan North Road, Chaoyang-District, Beijing, CHINA  
TEL : 86-10-6538-8070  
FAX : 86-10-6538-8077

### JTEKT EUROPE S.A.S. (FRANCE)

Zone Industrielle du Broteau, B.P.1, 69540 Irigny, FRANCE  
TEL : 33-4-7239-4444  
FAX : 33-4-7851-2188

### JTEKT EUROPE BEARINGS B.V. Benelux Branch Office

Energieweg 10a, 2964 LE Groot-Ammers, THE NETHERLANDS  
TEL : 31-184-606800  
FAX : 31-184-606857

## PUBLISHER

### JTEKT CORPORATION NAGOYA HEAD OFFICE

No.7-1, Meieki 4-chome, Nakamura-ku, Nagoya, Aichi 450-8515, JAPAN TEL:81-52-527-1900 FAX:81-52-527-1911

### JTEKT CORPORATION OSAKA HEAD OFFICE

No.5-8, Minamisemba 3-chome, Chuo-ku, Osaka 542-8502, JAPAN TEL:81-6-6271-8451 FAX:81-6-6245-3712

### Sales & Marketing Headquarters

No.5-8, Minamisemba 3-chome, Chuo-ku, Osaka 542-8502, JAPAN TEL:81-6-6245-6087 FAX:81-6-6244-9007

## Value & Technology

