All-New *Outlander /* All-New *Outlander* PHEV model

A New Crossover SUV with a Product Concept of "Majestic"





Featuring a heritage-inspired powerful design, a high-quality, spacious interior, and three rows of seats to accommodate seven passengers. Also, a newly developed platform, electronically controlled 4WD and S-AWC enable safe and secure driving in all road conditions.

The all-new *Outlander*, developed as Mitsubishi Motors' flagship offering, is available in gasoline engine and PHEV models. An SUV with reliable driving performance, the all-new *Outlander* offers not only comfort, but also a safe and enjoyable ride for all in any weather or road conditions.

The new PHEV system used in the PHEV model is a new generation with higher motor output and larger battery capacity. The cruising range has been extended and provide an even more powerful driving experience to make the electric vehicle even more attractive.

All-New Outlander

Product features of the gasoline engine and PHEV models

- Heritage-inspired powerful design
- Safety and safe driving performance
- High-quality spacious interior



All-New Outlander / All-New Outlander PHEV model



We have focused on the value that Mitsubishi Motors can provide to customers: "power," "confidence" and "quality."

> **Ryuichi Kimura,** Manager CPS (Global Vehicle) Team, Product Strategy Division

The all-new *Outlander*, now in its fourth generation, was developed to meet basic needs such as safety and practicality, and to help our customers take on new challenges and expand their range of activities.

Specifically, based on the "majestic" concept, we have developed a vehicle with a powerful exterior design, reliable driving performance in all weather and road conditions, a high-quality spacious interior, and smooth and powerful acceleration performance for the PHEV model.

The appearance invokes a sense of stability and security, as if the tires are firmly seated on the four corners. We have created a high-quality and comfortable interior space while expressing confidence, from the feeling of being enveloped in the seats and the comfort of sitting in them, to the sound when the door is closed, the thickness and ease of grip of the steering wheel, the feel of the operation dials, and the sounds of the notifications.

Responsive and brisk acceleration, firm braking, nimble handling, easy maneuverability, and overwhelming stability at high speeds, gives the driver a sense of being able to go anywhere. Various driving support functions help reduce fatigue during long-distance travel.

The true value of this car is demonstrated on unpaved and snow-covered roads. We have made further inroads on the 4WD technology we have cultivated to date, providing a drive mode that ensures safe and enjoyable driving in any road conditions, and provides optimal all-time four-wheel control for stable driving.

The PHEV system delivers everything our customers have wished for. We have retained the smooth EV-like driving and twinmotor 4WD features of the previous-generation model. Meanwhile we have extended the EV driving range, made acceleration more powerful, and provided a cruising range suited for longer-distance travel. In addition, we have designed the PHEV model with seven seats in response to strong customer demand.

Nothing would give me more pleasure than to help our customers lead fulfilling lives by going out and having fun with their families and friends in the all-new *Outlander*.





A host of vehicle tests are performed to ensure that the Outlander will be a reliable partner for our customers, from the moment they first open the door and get in the car.

> Fumihiro Shimoda, Assistant Manager Vehicle Testing Department, Vehicle Engineering Development Division 1

Vehicle tests for the Outlander ranged from daily commuting and shopping to extreme driving situations such as on flooded roads in heavy rains, deep mud, snowy roads, on test tracks, circuits, and closed mountain roads late at night, as well as on roads in the countries where the model is to be shipped. We have evaluated and improved every single switch, meter and NAVI indicator, and sound in pursuit of ease of use, sense of touch and comfort. We hope you will see, touch, and feel every inch of the car when you get into it. Once you start

driving, you will realize that the vehicle's well-trained control system makes it possible for anyone to drive anywhere in safety, security and comfort.

The PHEV model stretches the potential for precise and highly flexible control through electrifica-



tion technologies and two independent front and rear motors, achieving outstanding vehicle control.

As one of its developers, I hope the Outlander will serve as a reliable partner for our customers and become a car that will be loved for many years to come.





When developing the seats for the all-new Outlander PHEV model, we strove to provide a sense of feel befitting the vehicle concept of "majestic" and its superb driving performance.

Ryota Kawano

Vehicle Functional System Testing Department, Vehicle Engineering Development Division 1

The first row of seats in the allnew Outlander PHEV model has a two-layer cushion structure that is soft at the moment of contact and gradually becomes more resilient to gently embrace the body. In addition, the shape of the side bolster section was studied at millimeter increments. Rigidity of this portion is different from the main section, and is fine-tuned to firmly support the body even on rough surfaces.

In the second row, the seatback size was increased significantly and the shape was adjusted in millimeter increments to conform to the body. As a result, the body

is supported over a wider surface area, providing better pressure distribution and allowing the rider to relax for a longer period of time.

The third row was the most difficult. With the SUV's large cargo area and the electrical components beneath the floor, the available space was narrow and limited. Even so, we remained uncompromising in our approach, creating a third row and our thoughts are firmly in place. Although constrained on cushion thickness, we built a seat-shaped surface right into the cushion. This arrangement made it possible to create a seat

that stabilizes the body while driving and prevents fatigue even over long periods of time.

As you experience the charm of the all-new Outlander PHEV model, we hope you will enjoy the seats that we have put our heart and soul into designing.



Mitsubishi Motors' proprietary integrated vehicle dynamics control system, Super All Wheel Control (S-AWC) optimizes the control of driving and braking forces to the four wheels.



We are continuously evolving the S-AWC and introducing technologies that meet the needs of the times to provide customers with "a car that anyone can drive safely and comfortably anywhere."

> **Tomo Kato,** Manager EV and Powertrain Advanced Engineering Department, EV Powertrain Engineering Development Division 1

The Philosophy Behind the Development of AWC Four-Wheel Control Technology

The development philosophy of our all-wheel control (AWC) driving control technology is inspired by the cheetah, which runs agilely across the savanna on its four legs. Similarly, we have sought to use all four tires for driving, cornering, and braking. By balancing and maximizing the capabilities of all four tires, we have worked to achieve "at-will maneuverability" and "outstanding stability."

"At-will maneuverability" means the ability to drive, turn, and stop at the driver's discretion under all circumstances. "Outstanding stability" refers to strong roadworthiness, straight-line stability, and turning ability.

To realize these goals, we used technologies to distribute appropriate driving and braking forces to the front, rear, left, and right wheels, and control the driving and braking forces to keep them within capacity of the tires. Basic performance considerations, such as weight distribution and body rigidity, are also important to enable the car to move with such control.

By amassing technologies such as these, Mitsubishi Motors provides customers with cars that anyone can drive, anywhere, with comfort and peace of mind.

S-AWC Embodies the AWC Philosophy at a High Level

The Lancer *Evolution X*, which appeared in 2007, was our first model to adopt the Super All Wheel Control (S-AWC) system, which integrates three aspects-4WD, active yaw control (AYC) and ABS/Active Stability Control ACS), embodying our AWC philosophy at a high level. 4WD distributes driving forces between the front and rear wheels. AYC controls torque vectoring between the left and right wheels. Meanwhile, ABS/ASC controls the braking forces of all four wheels to control driving and braking forces in all four wheels

under various driving situations. In addition, to make the vehicle's driving, cornering and braking movements comfortable for the driver, the three components are seamlessly and continuously integrated to dramatically improve maneuverability and stability.

Not only does it demonstrate excellent driving performance on slippery surfaces such as off-road and on snow-covered roads, these features help all drivers and passengers to drive comfortably and safely in everyday driving situations.



Front/rear driving force distribution: Maximizes start-up acceleration and turning performance by distributing driving force to the front and rear wheels in a well-balanced manner Left/right torque vectoring: Controls the yaw moment acting on the vehicle to improve maneuverability and driving stability

Four-wheel braking control: Increases driving stability by controlling the amount of slip on each of the four wheels

Electrification Expanding the Potential of S-AWC

The Outlander PHEV, which appeared in 2013, was the first to adopt S-AWC, which combines twin-motor 4WD with brake AYC and ABS/ACS, each with highoutput drive motors on the front and rear wheels. Conventional 4WD systems in engine-powered vehicles consisting of a combination of gears and clutches cannot achieve the desired front/rear driving force distribution according to driving conditions due to physical limitations. However, our twin-motor 4WD freely controls the distribution of driving forces between the front and rear wheels, by taking advantage of the features of electric motors. This allows it to move precisely and instantly, facilitating the ideal distribution of driving forces between the front and rear wheels to maximize start-up acceleration and turning performance in a balanced manner, regardless of road surface and

driving conditions. By combining a PHEV (which delivers the remarkably smooth, stable, and powerful driving that only a motor drive can provide) with S-AWC (which realizes ideal driving force distribution between the front and rear wheels), we came one step closer to achieving the "at-will maneuverability" and "outstanding stability" the AWC philosophy aims for.

The Future of S-AWC

To improve the performance of S-AWC, we will need to increase the precision, responsiveness and degree of freedom of driving force distribution between the front and rear wheels, torque vectoring between the left and right wheels, and four-wheel braking control. For example, using dual motor AYC (which consists of two motors and a unique gearbox) and electrifying the brake calipers will make fourwheel driving force control more precise and responsive. When this is combined with the new generation of integrated controls, the effect will be apparent even in places where front/rear and lateral acceleration are very small. This will deliver smooth acceleration that makes the vehicle feel light, as well as precise cornering and outstanding straight line stability.

Combining CASE and S-AWC will further enhance the value of each. By utilizing the information obtained through connectivity, it will be possible to automatically switch to optimal driving characteristics for each road surface, taking S-AWC driving performance anywhere. In addition, as anyone can take advantage of S-AWC driving performance, the technology can be used in automated driving, where the driver is replaced by an AI, and in car sharing, where an unspecified number of people will drive. The high levels of precision, responsiveness and freedom of control that electrification makes possible will support the further evolution of S-AWC.



Mitsubishi Motors' PHEV was created to compensate for the short cruising range of EVs while taking advantage of their clean and powerful motors.



In the nine years since developing the first-generation Outlander PHEV, which offered sufficient EV driving range for daily use and powerful acceleration due to engine power generation, as well as a long cruising range, we have been working to improve components and control systems that make PHEVs even more attractive. Naoki Miyamoto

EV and Powertrain Control System Development Department, EV Powertrain Engineering Development Division 1

A PHEV Offering Enhanced EV **Uniqueness and Power**

For the all-new *Outlander* PHEV model, we paid particular attention to EV characteristics and the power befitting an SUV. We also worked on updating the drive battery and drive motor.

Customer requests to reflect EV characteristics in PHEVs include "I want to drive long distances in EV mode" and "I don't want the engine to start even if I press the accelerator." To achieve these aims, we made major revisions, starting with the drive battery. First, to ensure sufficient EV driving range even when air conditioning is used, we used a new cell for the drive battery, increasing capacity by more than 40%. At the same time, we

boosted power output by 40% by devising cooling and control systems so that EV driving continues even when the accelerator pedal is pressed firmly.

The drive motor is essential when designing an SUV that has power comparable with that of a conventional gasoline-enginepowered vehicle. The motor must be capable of accelerating a heavy vehicle with lightness and agility. Especially for the front motor, we found a way to increase the supply voltage. This allowed us to generate high power even within the engine compartment's confined spaces. We boosted torque by more than 80% to improve starting capabilities. In addition, we increased output by more than

40% to sustain pleasant acceleration at high speeds.

To maximize the use of the new electrical components, the control systems that manage the drive battery's temperature and the drive motor's output have also been upgraded to a new generation. We had to manage these adjustments carefully, as motors with increased torgue tend to cause vehicle vibration, and batteries with increased power output tend to make engine noise more noticeable. We incorporated various innovations to highlight EV characteristics and ensure power, and developed the control systems through repeated testing and adjustment.

More Powerful Electrical Components





Three Rows of Seating and a Long Cruising Range

To provide three rows of seats in the all-new Outlander PHEV model, it was essential to make the rear motor control unit (RMCU) more compact. In the past, the RMCU was located in the luggage space inside the cabin, so three-row seating was not possible. We reduced the size of the rear motor by reshaping the RMCU's winding and semiconductor elements. We also integrated the RMCU into the rear motor, which is outside the vehicle cabin, to free up luggage space and provide space for three rows of seats.

An SUV with three rows of seats

must also have a long cruising range to facilitate long trips with many people, so the fuel tank must have sufficient capacity. The fuel tank is located near the drive battery and rear motor, so space is limited. However, we used a resin material that could be freely molded to create a more three-dimensional shape. This approach allowed us to provide a 56L fuel tank, even in the limited space under the rear floor. These arrangements succeeded in providing a cruising range that, combined with the EV driving range, reaches approximately 1,000km (test value in WLTC Mode), while at the same time ensuring the convenience required of an SUV.

Quick-Charging and V2H Compatible

In addition to offering regular charging and quick-charging, Mitsubishi Motors' PHEVs are V2Hcompatible. This means the vehicle can be connected to a house via a quick-charging port so that it can be used as an EV.

Our PHEVs carry forward the environmental performance characteristics of EVs. For example, they can run on clean energy such as solar power, charging at night and storing power in the car. Power can then be discharged from the car during the daytime, when large amounts of power are needed, to shift peak demand.

PHEVs can supply more power than EVs because they can also generate electricity from their engines. The all-new *Outlander* PHEV model can supply up to about 12 days' worth of electricity, based on average household energy consumption. In the event of a major earthquake, restoring power can take as much as a week, so this high power supply capability also helps with disaster preparedness.

Compact Electrical Components and Three Rows of Seating



The All-New *eK X EV*

A Newly Designed EV Model in the *eK X* Series Offering SUV Flavor in the Kei-Car Category





The driving range of 180 km (WLTC Mode) on a single charge is ample for everyday use. A spacious, comfortable interior that is easy to use; smooth and powerful driving unique to EVs; unparalleled quietness and good ride quality, and more advanced driver assistance features and connected technology assure comfort and convenience.

The all-new *eK X EV* features a powerful SUV-style design with specialized parts to emphasize its EV characteristics. The 7-inch color LCD meter and selector lever are also designed for EV functionality. In addition, the newly developed EV system has a layout optimized to ensure a spacious and comfortable interior, while the low center of gravity and ideal front-rear weight distribution provide excellent handling stability and good ride comfort. Meanwhile, the large-capacity drive batteries are reliable in emergencies. They can also help to address electricity supply and demand issues. They provide a convenient source of power to run appliances, and they can be used to provide a source of household power.

Product Features of the All-New eK X EV

- Easy-to-use for everyday ride
- Friendly to passengers and to society
- Clean design and functional features of an EV



The All-New *eK X EV*



We aimed to develop an EV in the Kei-car category that is accessible, familiar, and easy to use for everyone, while answering the growing focus on carbon neutrality.

Takahiro Atsuumi

CPS (Domestic Vehicle) Team, Product Strategy Division

Easy-to-Use for Everyday Ride

As carbon neutrality comes into sharper focus in the coming years, the trend toward EVs is likely to accelerate. While various companies are developing and marketing EVs, our current focus was on EVs in the Kei-car category that are familiar and easy for everyone to use. In a survey of the type of EVs people would like to purchase if they were available in any pattern, about 80% of the respondents chose "Don't mind" or "Same model." Accordingly, on this model we held back on special features to make it an easier choice for customers. That is also why we launched this as part of the eK series, which has already been well-received.

The newly developed battery delivers a total of 20kWh of electricity, sufficient for daily use in commuting, shopping, and transportation, and has a driving range of 180km per charge (WLTC Mode). We chose this capacity because our research shows that approximately 80% of users of Kei-car category vehicles and compact cars have a daily driving range of 50 km or less. We therefore provided ample capacity for making a round trip, even with a one-way trip distance of 50km. The device is equipped with both quick-charging and normal charging ports, allowing for normal charging at home and quick-charging when away.

Also, some customers are concerned about battery deterioration, so we focused on curtailing the rise in battery temperatures, as this is one factor that shortens battery life. We adopted a cooling system using an air conditioner refrigerant that helps maintain high levels of charge even when driving at high speeds or quickcharging repeatedly.

Friendly to Passengers and to Society

Although the *eK X EV* was developed within the framework of Keicar category vehicles, we provided a considerable amount of equipment aimed at ensuring safety and comfort for all users. In addition to "My Pilot," which is already available on gasoline-powered vehicles, the new model features a 9-inch smartphone-connected navigation system that displays EV-related information. We offer "My Pilot Parking," the first parking assistance function in a Kei-car category vehicle, SOS calling, and connected technology that allows remote control of air conditioning and other functions via an app.

The *eK X EV* can also help in shifting peak power demand. The drive battery can be charged at night using the timer charging function. The power stored in the drive battery can then be accessed during the day to power the home, functioning as a Vehicle to Home (V2H) device. In addition, the *eK X EV* can be used as an emergency power source, providing enough power to last for a day* in an emergency. This makes the vehicle convenient to use, whether you are inside it or out.

* Assuming daily electricity consumption of 10 kWh for an average household

"My Pilot Parking" parking assistance function

(Results of NRI's quantitative survey on communication strategy for new EVs in the Kei-car category)





Functionality Unique to EVs

The *eK X EV* is much quieter than a gasoline-powered model, as well as the previous-generation i-MiEV, thanks to the location of the motor and other components that cause vibrations. We have lowered the center of gravity by placing the drive battery, which is the heaviest component, in the center under the floor, resulting in less roll. In addition, we have improved the front/rear weight distribution to 56:44. This provides a better balance and a more stable driving experience than is typical from a vehicle in the Kei-car category.

The maximum torque is 195Nm, which is about twice that of the

gasoline turbo model. An innovative pedal operation mode allows the driver to control acceleration and deceleration by operating the accelerator. Three drive modes (eco, standard and sport) are available, allowing the operator to enjoy a crisp and lively driving experience.

All models are equipped as standard with "grip control," which is effective for snow-covered roads and in other bad road conditions. This enables precise power output and brake control unique to EVs. In development test runs, even a 2WD vehicle was able to stop and start on packed snow with a steep 12% gradient. We are proud to note that our vehicles can be used safely and comfortably throughout the year.

As a member of the *eK* series, the *eK X EV* has a familiar look and feel that will satisfy a wide range of customers. Meanwhile, it is available at a reasonable price and with a significantly improved and enhanced interior. We look forward to having customers experience this innovative car, which cannot be described by its specifications alone.

New XPANDER

A Crossover MPV with SUV-Like Styling and More Robust Environmental Performance





The XPANDER, a new crossover MPV, has been redesigned to improve environmental performance. The front and rear, as well as the interior, have been redesigned to enhance the SUV-like appearance, and a new high-efficiency CVT transmission has been used to achieve lower fuel consumption.

Mitsubishi Motors developed the *XPANDER* by conducting thorough research to find out what was lacking with conventional compact MPVs and then considering what would be needed from an MPV of its own. Developing a vehicle steadily tailored to meet user needs, we began by launching the *XPANDER* in Indonesia in 2017. We then expanded the rollout to the ASEAN region, the Middle East, Latin America, South Asia and Africa. The *XPANDER* has become a globally strategic vehicle for us, with annual sales reaching 100,000 units in 2021.

The new *XPANDER*, which has undergone major improvements, has evolved into a more active and tougher model that will enhance the driving experience of our customers.

*Unit sales of the XPANDER and XPANDER Cross

Product Features of the New XPANDER

- Interior and exterior design with enhanced SUV-like features and a higher-quality feel
- Improved driving performance along with enhanced environmental performance
- Comfortably appointed with consideration for smartphones and various storage spaces



New XPANDER



A Next-Generation Crossover MPV Offering Enhanced Robustness and Quality

> Takami Kaji CPS (ASEAN Vehicle) Team, Product Strategy Division

The *XPANDER* has been well received in more than 70 countries and has grown to become a core model for Mitsubishi Motors. Originally, though, the model was planned and developed as "a car for Indonesia."

We anticipate further demand in Indonesia, where MPVs accounted for nearly half of the automotive market when the project began. On the other hand, competition is fierce from numerous manufacturers and models. Although a latecomer to the market, we began development with the goal of creating an MPV that would be appreciated in Indonesia. We conducted repeated on-site surveys to find out as much as possible about how Indonesians use and think about MPVs, as well as any areas where users were dissatisfied or

had requests. We visited Indonesia many times, held discussions with local employees and followed a process of trial and error. It is no exaggeration to say that this accumulation of knowledge and a love for Indonesia were essential to producing the *XPANDER*.

The new *XPANDER*, which was planned and released in November 2021, retains this enthusiasm from the past.

The new XPANDER is available in different configurations depending on the country of sale, but two changes have been made. First of all, the interior and exterior appearance of the SUV, which had been well received since its inception, has been further enhanced. Also, the distinctive dynamic shield and other design features that convey the power of the XPANDER itself are employed throughout. The interior of the highest grade is top-end quality, with soft padding on the armrests and door trim.

Next, in terms of functionality, USB ports and cup holders have been added to the secondrow seats for convenience when there are many passengers. Other features aimed at providing comfort in the cabin include synthetic leather with a function that suppresses temperature rises and speed-sensitive door locks.

The *XPANDER* will continue to evolve in step with its customers.





Headlamp Light Distribution Intended to Brighten Areas Drivers See Most

Jun Takatsuji, Assistant Manager Vehicle Testing Department, Vehicle Engineering Development Division 1

While we were pleased with the positive response to the launch of the *XPANDER*, we received a customer comment that the light distribution made the headlamps seem "somewhat dark."

We tried to find where the customer felt the headlamps were dark, but we were unable to pinpoint a definite location, so we decided to look at the way the customer used the headlights. First, we recreated a typical local scenario and ran it on the test course. Using sensory evaluation to visualize where the driver was looking, we found the source of the problem. For example, when going around a tree-lined curve, the further you proceed into the curve, the darker it seems ahead. This is outside of the area designed to be bright. Now we were able to understand why the customer felt the headlights were "somewhat dark," so we could address the problem. At the stage of planning the distribution of light from the headlamps, we added new areas to the criteria for enhancing brightness. We included conditions for changing the level of brightness in areas that people may perceive as dark. This model change produced headlights which would no longer make the driver feel dark.



Developed to Be Comfortable for Customers to Use within Constrained Spaces

For customers in the ASEAN market or where traffic congestion is com- h monplace, a cup holder has been cu added to the center armrest of the d rear seat of the new *XPANDER* to make travel more comfortable. m

However, the shapes and sizes of cups brought into the car can vary, and cup sizes change faster than car development cycles. This made it difficult to decide the size of the cupholder. We worked together with local team members in Thailand and Indonesia. After ordering and researching a variety of cups, we determined that the holder should accommodate large cups, and then decided on the dimensions of the cupholders.

Another issue was that accommodating large cups meant that the holder had to have a large diameter and be deep enough to accommodate large cups. We had to also make it easy to lift out small cups and keep them from falling over due to vibrations from driving. Furthermore, we needed to account for space for placing elbows on the armrests even with the cups in the holders.

Although it is difficult to come up with designs that meet such varied requirements within a restricted space, we did our best to develop an arrangement that customers can use comfortably.

Hidetoshi Kita, Assistant Manager

Vehicle Functional System Testing Department, Vehicle Engineering Development Division 1





Always Working to Understand How Customers Use Our Products and Reflect Their Needs

Ryota Kawano

Vehicle Functional System Testing Department, Vehicle Engineering Development Division 1

The seats on the new *XPANDER* are made of synthetic leather with a function that helps curtail temperature rises. Also, the second-row seats have cup holders in the armrests, which is a new feature. It was a challenge to balance the addition of cup holders with seating comfort. If we used a simple mount for the cup holders, we thought the center seat would be uncomfortably hard. In the ASEAN



region, vehicles frequently carry multiple passengers, so we could not make any compromises on the center seat. We had to balance a number of constraints; we could not make the cushions thicker, because we needed to allow for a spacious minivan cargo area, but for practical purposes the cup holders needed to be larger. After studying the layout of the cup holders in millimeter increments, in the end we built the seats ourselves, cutting the cushions and checking the quality of the materials. Going forward, we will continue to listen to feedback from our customers and build seats that reflect their input.