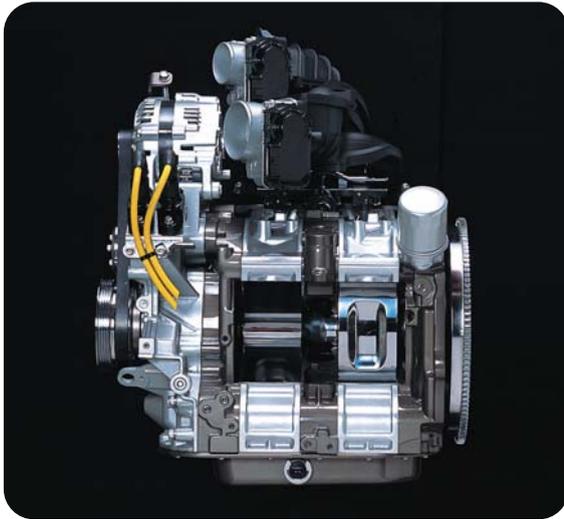


## RENESIS

– New-Generation Rotary Engine for the Mazda RX-8 – [Reference exhibit]



The RENESIS is a naturally aspirated rotary engine set to power Mazda's new four-door four-seater sports car, the RX-8 (reference exhibit). The name stands for RE (Rotary Engine) GENESIS, and the engine is a development and refinement of the MSP-RE engine, which powered the RX-01 concept sports car, unveiled at the 1995 Tokyo Motor Show. The latest version of the RENESIS new-generation rotary engine is compact, lightweight and delivers outstanding performance, all essential to the unprecedented four-door, four-seater sports car concept of the RX-8.

### Side-exhaust, side-intake configuration

The major innovation in the RENESIS design is the side-exhaust, side-intake configuration. The exhaust ports, previously located on the trochoidal housing of a conventional RE (Fig. 1-a), are now situated on the side housing of the rotor chamber (Fig. 1-b). The major advantage of this new configuration is that undesirable overlap between the opening of the exhaust and intake ports has been eliminated (Fig. 2) allowing port profile optimization. Compared to

conventional REs, the intake port area is enlarged by 30% (Fig. 3), greatly improving intake resistance. In addition, the RENESIS rotor is lighter than that of the series production unit, raising the engine's rev limit. In all, RENESIS has attained outstanding performance specifications, such as maximum output of 184kW (250PS)/8,500rpm and maximum torque of 220Nm (22.4kg-m)/7,500rpm – the highest power density ever achieved by a naturally aspirated RE.

Conventional REs feature a single, peripheral exhaust port, while the RENESIS has two exhaust ports for each rotor, achieving exhaust port area twice that of conventional designs. In addition to improving exhaust flow, this configuration also allows exhaust port timing to be delayed. The result is an increased expansion stroke and improved thermal efficiency, contributing to improved fuel efficiency. What's more, the RENESIS traps unburned hydrocarbons in the exhaust chamber and retains them for combustion in the next cycle (Fig. 4), a process which greatly reduces emissions. The unique gas- and oil-sealing system includes cut-off seals, and is specifically designed to match the side-exhaust configuration. The tighter sealing greatly improves output, fuel efficiency and emissions.

### Three-stage induction system and twin electronic throttles

RENESIS is equipped with a 6PI (six-port induction) variable induction system, featuring three intake ports for each of the two rotors. The system employs DC motors to open and close shutter valves at the intake ports of each rotor to utilize the incoming air's dynamic charge effect and improve filling efficiency. In addition, the RX-8's RENESIS also features twin electronic throttles that convert throttle input to an electronic signal for more accurate and responsive valve control. Finally, the newly adopted resin intake manifold is lighter and is designed to have superb

laminar air flow minimizing air resistance and intake losses.

### Finer fuel atomization, powerful ignition and advanced engine management

The RENESIS engine features ultra-fine fuel injectors for improved fuel atomization. Small, high-power coils provide a more powerful spark for enhanced ignition. The combination of ultra-fine injectors and powerful ignition results in virtually complete combustion, which directly translates into higher fuel efficiency and lower emissions. An advanced engine management system provides even more precise control than the conventional oxygen-sensor feedback system.

### Double-skin exhaust manifold for enhanced catalyst activation

The double-skin exhaust manifold maintains a high exhaust-gas temperature to improve catalyst activation on engine start in cold conditions. The catalyst is a two-stage type featuring manifold and underfloor converters.

### Wet-sump lubrication system

The new low wet-sump lubrication system features an oil pan just 40mm deep, about half that of a conventional RE. A major advantage of the RE is that the eccentric shaft is placed higher than the crankshaft in a conventional reciprocating engine, out of the sump and thus free of windage losses. Furthermore, power losses to the oil pump are lower than in a dry-sump system. In addition, the RENESIS wet-sump system controls movement of oil, even under the highest lateral acceleration, with an elaborately shaped baffle chamber in the oil pan. The weight of the RENESIS system is about 3% lighter than the dry-sump system employed in the MSP-RE.

### Major Specifications of RENESIS

Type	Water-cooled, in-line 2-rotor
Displacement	654cc x 2
Maximum output (target figure)	184kW (250PS)/8,500rpm
Maximum torque (target figure)	220Nm (22.4kg-m)/7,500rpm

