



Traveling speed: 1.8 to 14.7 mm/s  
 Hill-climbing: Able to ascend slopes of approx.  
                   5 degrees  
 Operating voltage range: 1.5V to 2.2V  
 Weight: 4.3g  
 Dimensions: (W) 11.0 x (D) 12.4 x (H) 10.8 mm  
 Recharging method: Automatically recharges while  
                                   in case (Antenna: Positive;  
                                   Tail: Negative)  
 Number of components: 98  
 Exterior: 92.5% sterling silver  
 Price: 50,000 yen

### Product Features

Monsieur, an ultraminiature, self-propelled mobile robot, went on sale in 1993. The first model in the Epson Micro Robot System (EMRoS) series, Monsieur was a product born of the watch-related technologies cultivated at Epson over many years. The product's actuator, CPU-IC (brain), and power supply made full use of Epson's energy-saving technology, skill in miniaturization, and ability to provide increasingly advanced functionality. It housed, among other parts, an ultraminiature stepping motor, a low-power IC used in quartz watches, and a crystal resonator. The microrobot was designed so that, when these parts were combined with a photodetector, it would advance toward a light source directed at it.

Monsieur's most striking feature — the one that earned it a place in the Guinness Book — was its compact size. Its body, with a volume of only 1 cm<sup>3</sup>, contained a total of 98 components. It was able to travel unassisted and wirelessly, keeping its balance with a pair of antenna-shaped wires on its front side and another at its rear. Moreover, the diminutive body housed a rechargeable power supply.

After Monsieur came more additions to the historic EMRoS series of microrobots. Niño, released for sale in 1994, was half the size of Monsieur. The following year, 1995, saw the arrival of Ricordo, equipped with storage and playback functions, and Rubie, equipped with a wandering function. All the robots could chase a light source.

### Background

The International Contest for Hill-Climbing Micromechanism was held by the Japan Society for Precision Engineering in October 1991. Viewing the contest as an opportunity for showing off Epson's advanced miniaturization technology, the company's product designers began developing Monsieur, the world's first one-square-centimeter microrobot. This idea had already been refined by the autumn of 1990, but a number of obstacles presented themselves: the presence of too many components, the stability of parts secured in place, the reliability of wiring, and the inability to procure photodetectors. The designers began their quest to surmount these challenges only a month before the contest, and finished collecting the components only a week before. Amid this breakneck schedule came the birth of Monsieur.

### Impact

The humorous Monsieur was a big hit at the contest; appearing on the venue's display monitors, the robot caused a great hubbub when it began to move. Ultimately, it achieved a respectable seventh place out of a total of twenty-two teams. Moreover, the little robot's novel design, evocative of an insect, captured a design prize. In all, it was a splendid debut. Later, Monsieur was commercialized for the Japanese market in 1993. This 1993 version had the honor of being listed in the *Guinness Book of World Records* as the world's smallest robot. Another honor came in 1998 when Monsieur was selected as part of the New York Museum of Modern Art's permanent collection. Development of these microrobots has continued as part of Epson's quest to advance its micromechanics technology. These efforts have also produced other prototype microrobots. Monsieur II-P, announced in March 2003 and equipped with Bluetooth wireless technology, is a power-saving robot that employs an ultra-thin sonic motor; while  $\mu$ FR, announced in November of the same year, is the world's smallest flying robot.