



Movement specifications  
 Wind system: Hand winding  
 Accuracy: Within  $\pm 15$  seconds for rate  
 ( $\pm 1$  second for daily rate)  
 Wind-up life: 45 hours  
 Jewels: 30  
 Dimensions: Diameter 29.0 mm;  
 Thickness 3.5 mm  
 Waterproof level: Water resistant in daily use  
 (water resistant to 30 m)

### Product Features

The design of the Spring Drive's movement drew on original Epson technologies and included a groundbreaking mechanism. This limited-edition watch was first sold in 1999 under the Seiko and Credor line, Seiko's luxury watch brand. It was hand-wound and spring-driven like a mechanical watch, yet it was controlled by a crystal resonator for outstanding, quartz-like accuracy.

The Spring Drive moved the hands through the power of a wind-up spring while simultaneously rotating the rotor, the movement of which was converted to electrical energy. The crystal unit controlled the rotor speed, and a groundbreaking speed control mechanism, the Tri-Synchro Regulator, was used to control the speed of the hands. Consequently, while the power source and train were identical to those used in mechanical watches, the Spring Drive was accurate to within a monthly rate of  $\pm 15$  seconds (equivalent to a daily rate of  $\pm 1$  second) and featured a sweep second hand. This timepiece was the first spring-driven watch in the world. Three limited edition models were released in December 1999 (in a platinum case under the Credor brand, and in an 18K gold case and a stainless steel case under the Seiko brand). These models came with transparent backs to showcase the exquisite beauty of the watch movement that included a bottom board with a Cote de Geneve design and a smoothly rotating rotor. The movements were meticulously assembled piece by piece by skilled craftsmen and women.

### Background

Twenty years passed between the time of the Spring Drive's conception and its actual production. Following the commercialization of the world's first quartz watch in 1969, Epson realized that battery life issues would have to be solved in subsequent models. The company therefore conducted experiments on various methods to achieve this. Amongst these experiments, the original concept of improving accuracy by regulating the speed of a mechanical watch through the use of a crystal resonator was conceived in 1977. Epson registered patent rights in 1982, and research and development began. However, development was obstructed by the need to improve energy efficiency. The power consumption of the oscillation circuit was too great for the power generated by the spring and a great reduction of power consumption was required. Unfortunately, such a reduction in power consumption was beyond the reach of the IC technology of the day, so development was suspended. A second attempt at development was resumed ten years later. This time developers even went so far as to produce a prototype. Again, however, their efforts were thwarted by the need to reduce power consumption. The length of time that the watch could run on a single winding could not be increased, so practical utility did not seem possible. In 1997, a third attempt at development was begun. This time, an IC that realized low power consumption was finally developed, and the watch was commercialized in 1999. The Spring Drive represented the culmination of some of Epson's finest technologies: technical expertise for manufacturing mechanical watches; technology for quartz crystal oscillators; and semiconductor technologies.

### Impact

The groundbreaking design of the spring drive mechanism, which was announced at the 1998 Basel Fair, won worldwide acclaim. In 1999 the first commercial product (a limited edition model) was produced. The technology was further refined and a new model was released in 2002. Painstakingly assembled by skilled craftsmen and women and with a production run of just a few hundred units that made it a collector's item, the Spring Drive steadily established a position of high status in the market.