

The Seiko AGS Quartz Watch

January 1988



Movement dimensions: diameter 27.6 mm,
thickness 4.2 mm
Average monthly rate: ± 15 sec.
75-hour continuous operation
Calendar function

Product Features

The Seiko AGS (automatic generating system), introduced in Germany in January 1988, was the world's first quartz watch to be equipped with an automatic power generating system. An ultra-compact power generator was built in, so the AGS had no battery that needed replacing. Introduced at a time when global ecological issues were in the public eye, the AGS was spotlighted as a groundbreaking watch that would launch a new era of quartz timepieces.

The automatic generating system watch (AGS) works on essentially the same principle as a bicycle lamp with a dynamo powered by the turning of a tire. The movement of the arm on which the watch is worn causes a built-in rotor to rotate, and a gear train multiplies the rotational speed by a factor of approximately 100. This is used to spin a power-generating motor at ultra-high speed. The current that is generated by this motor charges a capacitor. The capacitor supplies the electricity needed to drive the timekeeping circuits.

The AGS is equipped with a small, high-performance generator that has been modified so that it produces power even when arm movements are slow, yet it is still able to withstand sharp movements without breaking. In addition, Epson slashed current consumption by developing a number of new components, including a CMOS IC, stepping motor, and capacitor, as well as by establishing technology for winding tiny coils with wire having a diameter of $13 \mu\text{m}$. The design team succeeded in reducing total power consumption to just $0.7 \mu\text{W}$ and in driving the watch for up to 75 hours on a single charge.

Background

Quartz watches had batteries that needed to be replaced, since their drive systems relied on battery power. This reliance on batteries was an issue from the start of quartz watch development, as there were concerns about issues such as the watches' practicability in regions where batteries would be difficult to obtain and the disposal of used batteries. Ever since the advent of the quartz watch, Epson had been laboring to develop a product that would overcome these obstacles. The company even developed products such as a long-life quartz watch and a solar watch.

Along the way, Epson began focusing particularly on a watch with an automatic power generating system, one that would merge an automatic-winding drive system with the accuracy of a quartz system. In 1985, a prototype of this AGS watch was completed, and the following year it was exhibited at the Basel Fair, a European watch, clock and jewelry fair held annually in Switzerland. Then, finally, in January 1988, the AGS, a quartz watch equipped with an automatic power generation system, was released to the world.

Impact

In April 1988 the first AGS quartz watch went on sale in Japan, under the name Seiko Auto-Quartz. The AGS, the product of an effort to create a battery-free watch, won wide acclaim in the United States and Europe, where interest in global environmental issues was particularly high. The AGS was even certified under Germany's tough Blue Angel Mark system as an environmentally friendly product. After the name of the mechanism was changed from AGS to Kinetic in 1997 to emphasize the convenience of a mechanism that uses the natural movement of the wearer's arm to generate power, the AGS mechanism went on to become one of the main models of Seiko wristwatches. It is now used in a great many different watch products. The automatic power generating system has been used in a variety of applications other than watches—including in a telemeter system for studying the ecology of whales. The development of this AGS was recognized in 1996 with the prestigious Okochi Memorial Technology Prize.

In 1999, Epson created the Kinetic Auto Relay, a new watch with innovative features beyond the kinetic function, including a power-saving function that temporarily stops the hands but keeps time in memory, and a quick-start time relay function that automatically corrects the hands to the current time with just a few shakes.