



BALANCE WHEEL

THE CO-PILOT OF ROLEX PRECISION

At the heart of the legendary precision of Rolex watches lies an inseparable couple: the hairspring and the balance wheel. The two partners in this strategic couple receive far from equal consideration: the hairspring gets all the attention. It is easy to forget that this admirable little spring could not beat its hypnotic rhythm without the inertia effect produced by the balance wheel to which it is attached. The all-too-often-overlooked balance wheel is in fact every bit as strategic and brimming with know-how as its famous, slender companion.



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In 1957, thanks to a major Rolex innovation in balance wheel design for adjusting the movement's rate, the brand made major headway in terms of chronometric precision, confirming its reputation for excellence. Rolex engineers perfected a revolutionary system for fine regulating of the inertia of the balance wheel – the Microstella screws – which led to a distinct improvement in the regularity of the watch. This Rolex exclusivity is featured to this day in its movements, the only difference being that gold nuts are now used. One or two symmetrical pairs of these minuscule star-shaped components are screwed onto the inside of the balance wheel felloe, which measures approximately 1 cm in diameter. By slightly screwing or unscrewing the nuts (always done simultaneously to opposing pairs to preserve the poise), using a tool specially developed by Rolex, the watchmaker can modify the moment of inertia and the rhythm of the balance wheel, thus delicately correcting the regularity of its rate. He can also customize the watch, adjusting the balance wheel to the conditions under which it will be worn.

GOLD REGULATING STARS

To understand the role of the Microstella nuts in regulating the inertia of the balance wheel, imagine a figure skater spinning: to increase his speed of rotation, he brings his arms close to his body, reducing his inertia; to slow down, he moves his arms away from his body. In 1958, Hans Wilsdorf, the founder of Rolex, underscored the importance of the new balance wheel with Microstella screws for the future of the brand. Remarking on the intense competition in the field of chronometric precision, he wrote in a letter: "We must implement the new 'Microstella' movement. It will give us the necessary prestige to maintain our position!" In fact, he was so enthusiastic about this innovation that, for a time, he entertained the idea of using it as a selling point by engraving "Microstella adjustment" on the case backs of watches equipped with the new calibre 1560.

STRATEGIC COMPONENT

The balance wheel with Microstella screws married the advantages of the two regulating methods used in watchmaking at that time: a balance wheel with regulating screws and a second method using a tool called an index. The first provides great precision by virtue of the same principle (screws on the circumference of the felloe enabling modifications of its moment of inertia), but with the disadvantage of not allowing adjustments to the oscillator's function once it is mounted on the movement. The second and far more widely used method – regulating with an index – does allow adjustment of the oscillator in situ, but it is less precise and, more importantly, less stable in the long run.



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The ingeniousness of the Microstella screws resides in the improvement they bring to the concept of the variable inertia of the balance wheel with screws, by allowing the watchmaker to precisely regulate the balance wheel already mounted in the cased movement. The star shape of the nuts allows them to be grasped in any position.

FINEST OF TOLERANCES

The Rolex balance wheel is replete with know-how and complexity well beyond its gold stars. The ring consisting of the felloe and the arms is made of a copper-beryllium alloy with paramagnetic properties and a low coefficient of thermal expansion. The physical properties of the balance wheel and those of the hairspring, meanwhile, offset the effect of temperature variations on the oscillator, and in so doing guarantee the precision of the movement.

The balance wheels are machined from solid bars of material on the Rolex Bienne site, with extreme precision to ensure their perfect balance once mounted in the heart of the movement. The manufacturing tolerances are ± 2 microns, or two thousandths of a millimetre.

The Rolex balance wheel has a high coefficient of inertia (radius squared x mass), thanks to clever optimization that guarantees constant precision over time by reducing any external disturbances.

IN-HOUSE MANUFACTURE

The balance wheel is mounted on a minuscule staff whose manufacture requires special know-how. To minimize friction and allow the balance wheel and hairspring to oscillate as freely as possible, the extremities of this staff (the pivots) must be extremely fine. The pivots measure only 0.07 mm (or 70 microns) in diameter, the diameter of a human hair. To increase their resistance, they are “rolled”, a finishing operation that hardens the metal.

With the manufacture of the hairspring, all the components of the balance wheel, the pivot stones and the Paraflex shock absorbers that hold them in place, as well as the all-important lubricants, Rolex masters all the elements critical to the unerring precision and reliability of its movements.