ROLEX

THE ESCAPEMENT

KEY TO TIME

Have you ever wondered why a mechanical watch goes “tick-tock”?
The ticking is produced by the escapement, a strategic part that plays a key role in the movement’s measurement of time. This mechanism, consisting of several components, is a triumph of microtechnology. Its complex and exacting production process calls on all of the brand’s vast know-how and ingenuity.

"Tick": a tooth of the escape wheel locks against one of the pallets. Then, released by the sweep of the oscillator – the strategic duo formed by the hairspring and the balance wheel – the pallet fork lets the wheel "escape". The wheel continues to rotate and locks against the second pallet: "tock". Only one-eighth of a second separates the "tick" and the "tock" that are so characteristic of mechanical timepieces. Synchronized by the oscillations of the hairspring and balance wheel , the pallet fork continues its infinite pendular beat against the oblique teeth of the escape wheel at a rate of 28,800 beats per hour – 14,400 "ticks" and just as many "tocks".

INTERACTION WITH THE OSCILLATOR

Through its alternating beats, in interaction with the oscillator, the escapement is the "key to time" in the movement. It receives and regulates the raw energy from the mainspring and transmits that energy in impulses to the oscillator, which determines the division of time. Without the escapement, the mainspring would unwind in one go and release all its energy at once. And without the escapement to maintain the oscillations, the hairspring and balance wheel would rapidly lose their momentum and the movement would stop after a few minutes.

The escapement is emblematic of the art of watchmaking and the fruit of much research over the centuries. Along with the oscillator, it is one of the strategic components that determine the precision, reliability and autonomy of a watch. It is also one of the most complex and exacting to make. Production and operating tolerances are of the order of a few microns. Some parts, such as the impulse pin on the roller, the dart and the pallets are among the smallest components in a watch. Making the escapement is one of watchmaking's great challenges: it demands skill and state-of-the-art mastery of microtechnology.

THE SECRET OF ROLEX QUALITY

Rolex has developed its own tooling and machinery, and its own methods for the manufacturing, control and assembly of escapements at the Manufacture des Montres Rolex site in Bienne. The quality levels achieved in the Bienne workshops reduce to a minimum the need for delicate fine-tuning, or "finalizing", which is usually necessary to ensure optimal operation of the escapement. This is nigh on miraculous when one considers that so many different parameters influence the way the escapement system works. A prime example is the precise interaction of the pallets with the teeth of the escape wheel, which takes place within tolerances of microns: 0.01 millimetre too much or too little and the mechanism would stop.

The excellent results obtained by the Manufacture are no accident. They are the fruit of cutting-edge watchmaking expertise, great technical skill and rigorous methods for checking tolerances which allow high-precision parts to be produced in large numbers. For example, each tooth of the escape wheel on every movement made is checked and measured at two points to ensure that the very strict tolerances of a few microns are respected.

ESCAPE WHEEL, PALLET FORK, BRIDGE AND ROLLER

The escapement is in reality an assembly of four components: the escape wheel, the pallet fork, the pallet bridge (which holds the pallet fork in place, limiting its movements via integrated banking pins) and finally the roller and its ruby impulse pin, fixed on the oscillator staff. Working as a chain – from the escape wheel to the pallet fork to the roller – this assembly of components is subject to major mechanical stresses: the escape wheel and the pallets lock against each other 700,000 times a day or more than 250 million times per year. Parts made of synthetic rubies (the pallet stones, the impulse pin on the table roller and the bearings) are therefore used to minimize friction with the metal. The contact surfaces, in particular those on the escape wheel teeth, must be perfectly smooth and polished. Reducing friction is important because one of the great challenges with the escapement is to prevent energy loss, as less than 40 per cent of the mainspring's energy reaches the oscillator.

EXCLUSIVE LUBRICANTS

Lubrication is an essential and crucial step in maximizing the efficiency of the different parts of the escapement. Each escape wheel tooth, as well as the escape wheel pivots, must be perfectly oiled. The oil used must perform well under temperature variations and for many years. Rolex has developed exclusive lubricants, which give the escapement a considerably longer useful life and greater stability over time. They allow lengthened service intervals and increase the reliability and performance of the watches in the long run.

EXCLUSIVE CHRONERGY ESCAPEMENT

To further improve the energy efficiency of its calibres, Rolex has developed and patented an enhanced version of the Swiss lever escapement, the standard escapement for mechanical watches. This optimized escapement, named Chronergy, is the result of extensive research that led to a new design of the pallet fork and escape wheel. These two redesigned components are made of nickel-phosphorus, an alloy that makes them resistant to magnetic interference. The escape wheel has a cut-out design to make it lighter and reduce its inertia. Thanks to this innovative geometry, the

efficiency of the escapement, which continues to provide optimum reliability and resistance, is improved by 15%.

The Chronergy escapement is used in the new-generation 3235 and 3255 calibres presented by Rolex in 2015, and 3285, unveiled in 2018.