

## BREGUET TRADITION FUSEE TOURBILLON WITH SILICON BALANCE SPRING

### *The Breguet silicon balance spring enhances the new Breguet Tradition timepiece*

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The balance spring is one of a series of vital parts at the heart of the movement. Its regular oscillations give the movement its rhythm and regulate the flow of time. Crucial to the workings of a mechanical watch movement, the balance spring is also the most responsive in terms of improvements to timekeeping precision.

The balance spring is a very fine coil spring. Usually made of metal, it is vulnerable to shocks, magnetic fields and even the pull of gravity, which can cause warping. Made and marketed by Nivarox -FAR, a Swatch Group enterprise, the alloy traditionally utilised to make balance springs is designed to increase its rigidity as its temperature increases, offsetting in this way the balance's increased inertia stemming from the latter's heat expansion.

Long viewed as one of the key components of movement precision, the balance spring has benefited from a lot of research and experimentation, with Breguet leading the way.

In 1795, Breguet conceived the "Breget overcoil" spring, today still the reference in terms of balance springs, the choice of the finest watch houses and craft watchmakers. A.-L. Breguet got the idea of altering the balance spring's terminal curve by raising its end and bending it slightly as a way of improving its isochronism. Another Breguet, Louis-Clément, in 1830 sought to prevail over magnetic fields by crafting balance springs in glass instead of metal. Breguet himself had made balance springs in gold to counter oxidation. One such cylindrical spring was fitted in the celebrated Marie -Antoinette watch; its shape was designed to improve considerably its isochronism by repositioning its centre of gravity.

In 2006, Breguet introduced its first wristwatches with silicon balance spring and escapement. It combines the advantages and qualities of the earlier experiments. Silicon also possesses advantages of its own:

- Silicon is totally impervious to magnetic fields. Practical measurements have confirmed that when exposed to over twice the magnetic influence mandated by NIHS standards, silicon posted results 15 times better than the standard.
- The manufacturing operations of a silicon balance spring yield a broad variety of shapes, facilitating the highly accurate adaptation of its shape to precisely calculated models. The gap between two silicon coils can be varied according to the spring's specific function because silicon springs are produced by direct in-depth etching of silicon wafers and not by spiral winding like metal springs.
- Silicon balance springs are lighter than metal ones and thus less prone to deformation caused by the pull of gravity. They are also less vulnerable to shocks and provide far superior resistance to corrosion.
- Components fashioned from silicon are subjected to a special process that greatly improves their resistance to handling and shocks.

These silicon components are already in industrial production and incorporated in four Breguet calibres which are themselves in volume production.

One of the challenges of using silicon balance springs is the determination of their temperature coefficient. It defines the watch's capacity to maintain a steady rate whatever its running temperature. In this area, Breguet has benefited from a joint development with the Swiss Electronics and Microtechnology Centre (Swatch Group participation) and two other Swiss watch houses, for which a patent has been awarded.

After four years of service in various watch movements, Breguet can report satisfactory results with flat silicon balance springs. The next step was to turn out silicon balance springs featuring the celebrated "Breguet" terminal curve. Actually putting a curve into a sliver of silicon represented no mean exploit in the world of watchmaking. The springs are usually cut from flat wafers and remain uniformly thin strips. Getting silicon, devoid of the malleability of metal, to form a bend rising up from the coil required a complete rethinking of the production process, a technical challenge brilliantly mastered by Breguet technicians. The Breguet silicon balance spring will now be adding its specific advantages to silicon's on all Breguet movements, whatever their basic configuration.

Today, the new Breguet silicon balance spring is featured in the Breguet Tradition 7047 model with tourbillon and fusee-and-chain transmission. Inspired by the design of the first tourbillon-equipped pocket watches devised by Breguet himself, a platinum version is now available fitted with a movement fashioned in an anthracite-toned metal alloy. Its surface finish was obtained by a new and improved electrodeposition process using an alloy of precious metals of the platinum group with a hue darker than ruthenium's.

The fusee-and-chain transmission connected to the barrel ensures constant force for as long as the watch is running. A number of patents applications involve the large tourbillon resonator at one o'clock on the watch face, one for a titanium balance and three relating to Breguet silicon balance springs. A further patent was awarded for a power-reserve indicator positioned directly on the barrel.

Displaying impressive technical sophistication, this timepiece is the pride of Manufacture Breguet. The company is and remains an undisputed pioneer in horological research and development. Not only does it have numerous inventions to its credit, it is also able to exploit its technical advances in timepieces available on the market without undue delay or quantitative limitations.

Its new silicon balance spring opens promising avenues of development for Breguet, sure to generate further surprising achievements in the years ahead.

## BREGUET TRADITION :

### FUSEE TOURBILLON TIMEPIECE WITH BREGUET OVERCOIL IN SILICON

#### DESCRIPTION OF THE WATCH

REF. 7047PT/11/9ZU

**Case** round in 950 Platinum with finely fluted caseband. Sapphire caseback. Diameter: 41 mm. Rounded horns welded to the case, with screw pins securing the strap. Water-resistant to 3 bar (30m).

**Dial** in silvered 18K gold, hand-engraved on a rose engine off-centred at 7 o'clock. Individually numbered and signed Breguet. Chapter ring with Roman numerals. 60 -second tourbillon positioned at 1 o'clock. Open-tipped Breguet hands in polished steel.

**Movement** hand-wound mechanical movement clad in an anthracite gray alloy of platinum-group metals, with tourbillon regulator. Numbered and signed Breguet. Cal. 569. 16 lines, 43 jewels, 2.5-Hz frequency. Power reserve of 50 hours with power - reserve indication on the barrel drum. Torque regularity throughout the operation of the watch provided by fusee-and-chain transmission. Upper bridge of the tourbillon carriage in titanium. Breguet-shaped thin bar (barrette) in nonmagnetic stainless steel. Straight-line lever escapement. Breguet balance in titanium with four adjustment screws in gold. BREGUET balance spring in silicon. Adjusted in 6 positions.