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NEO CONSTANT ESCAPEMENT

THE MASTER OF ENERGY

La Chaux-de-Fonds,
11th October 2023 (10AM CET)

In 2013, Girard-Perregaux released the Constant Escapement L.M. to critical acclaim and won the 'Aiguille D'Or' at the GPHG (Grand Prix d'Horlogerie de Genève) in the same year. The model included a constant force escapement, a mechanism that delivered remarkable rate stability irrespective of the available energy.

The Neo Constant Escapement is the latest evolution of the Maison's groundbreaking approach to master energy, incorporating an array of aesthetic and technical advancements. While it took 250 years to develop the Swiss lever escapement, Girard-Perregaux perfected its Constant Escapement in just 20 years, a testament to its inventive spirit. Moreover, this new timepiece upholds Constant Girard's original idea of showcasing the beauty of functional elements, but expressed in a contemporary way.

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A history of precision and the origins of today's Bridges collection

In the 19th century, Constant Girard worked tirelessly in his quest to advance chronometry. He created several highly precise pocket watches equipped with tourbillon escapements. The excellence of these timepieces was soon recognised and the watchmaker received numerous awards and prizes. In 1860, he sketched out his design for a movement with three parallel bridges. The resultant pocket watch came to fruition in 1867 and the said three bridges were made of nickel silver. This watch won a first-class prize at the Neuchâtel Observatory in the same year. Its precision remained unequalled for 17 years. Moreover, this watch, subsequently housed in gold, won a gold medal at the Universal exhibition in Paris.

While Constant's creations were acclaimed for their precision, they were also recognised for their extraordinary aesthetic beauty. Indeed, in 1867 he created a pocket watch fitted with three prominent bridges. In one step, he transformed these bridges from being mere functional components into artistic elements. Later, in 1889, the three bridges were executed in gold and became more stylised: the legendary three bridges design language was born and lives on to the present day.

However, whilst Girard-Perregaux is proud of its heritage, it does not dwell in the past. In 2014, Girard-Perregaux unveiled the Neo Bridge, an elaborately shaped form only made possible by using cutting-edge CNC machines. The resultant sinuous bridges have since been presented in isolation or as a triumvirate of architectural forms. Indeed, the Bridges collection comprises a blend of classical and contemporary timepieces, each showcasing the versatility and know-how of Girard-Perregaux.

Clémence DUBOIS,

Chief Marketing Officer of Girard-Perregaux, remarks :

"The Bridges collection is one of the oldest mechanical signatures in watchmaking and is an important pillar of our Manufacture. Since 1867, the bridges have continuously evolved in terms of shapes, materials and finishes. However, this latest addition to the collection, the Neo Constant Escapement, is unequivocally neoteric and, courtesy of its revolutionary Constant Escapement, sets a new standard in terms of chronometry."

What's in a name ?

As previously mentioned, the name of the Neo Constant Escapement distinguishes this model as contemporary and also conveys the movement's rare ability to supply a constant force to the regulating organ. Moreover, the name of the watch also honours a man who devoted his life to the advancement of chronometry, Constant Girard.

The flow of time

Often termed the 'flow of time', the forces at play within a watch movement have to be controlled to ensure the various indications convey accurate information and the watch operates reliably. A tensioned mainspring, located within a spring barrel, provides a source of energy that ultimately powers the various dial indications. By sending the energy through a series of gears (the gear train), the magnitude of the energy can be reduced. Indeed, the gear train acts a little bit like an electrical transformer, stepping-down the voltage to the desired level.

Connected to the gear train, the escapement serves an impulse to the regulating organ which in turn allows the escapement to unlock, causing the hands to move a defined amount before locking again. It is this repeated locking and unlocking process that controls the 'flow of time'.

Constant force mechanisms

A problem that afflicts most watches is that when fully wound, the force from the spring barrel, ultimately serving the regulating organ, is excessive. This potentially impairs precision and can cause harm to the movement. Conversely, as the energy within the barrel diminishes, prior to the point of total exhaustion, the regulating organ receives insufficient force which again impairs precision.

This scenario can be shown graphically with the force appearing as a diagonal line. Ideally, the force reaching the regulating organ should be linear, appearing as a continuous flat/horizontal line on a graph. Invariably, on a watch without a constant force mechanism, the period when the force is flat, ie delivering optimum precision, is relatively short.

In the upper reaches of Haute Horlogerie, watchmakers have continuously strived to ensure that the energy from the barrel, that ultimately serves the regulating organ, remains uniform. For centuries, this aspiration, often termed 'constant force', has kept many watchmakers awake at night. Various mechanisms have been employed, including the fusée and chain, Geneva stopworks and remontoir d'égalité, all of which are separate to the escapement.

By serving the regulating organ with a constant force, the rate of the watch will remain stable. Rate stability is not the same as precision, it's arguably more important. Indeed, once the movement is regulated, a constant force mechanism will ensure the rate does not fluctuate, conferring superior chronometric performance. However, returning to the matter of precision, it must be pointed out that the Neo Constant Escapement is a certified chronometer (COSC), providing independent assurance of its timekeeping prowess. This is reminiscent of when the Manufacture submitted its pocket watches for chronometer testing in the 1860s and won the Neuchâtel Observatory Centenary Prize.

Looking more closely at the regulating organ (the balance and hairspring), the balance wheel rotates back and forth, clockwise and anticlockwise. Each swing, in either direction, is termed a beat and the amplitude is the magnitude of the swing expressed in degrees. Typically, when the force supplying the regulating organ is reduced, the amplitude drops and the movement runs slower.

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An ingenious means of achieving constant force

Unlike the aforesaid mechanisms, the Neo Constant Escapement employs a wholly different approach to achieving constant force. Indeed, the movement on this watch uses an ingenious silicium blade (see later) that ensures the amplitude of the balance remains uniform irrespective of the amount of energy stored within the barrel.

Matthieu, a gifted Watchmaker working in the Manufacture's R&D department, has spent more than a decade perfecting the Constant Escapement, making prototypes, refining the specification and filing numerous patents. This development process has involved honing the constant force device, taking it from a laboratory concept to a technology that can be employed on a series produced timepiece.

After several years of research, Girard-Perregaux unveiled a concept watch in 2008, incorporating the unique silicium blade. This know-how was perfected over the years and a production version of the watch, the Constant Escapement L.M., was released in 2013. It won the prestigious prize 'Aiguille D'Or' at the GPHG (Grand Prix d'Horologerie de Genève) in the same year.

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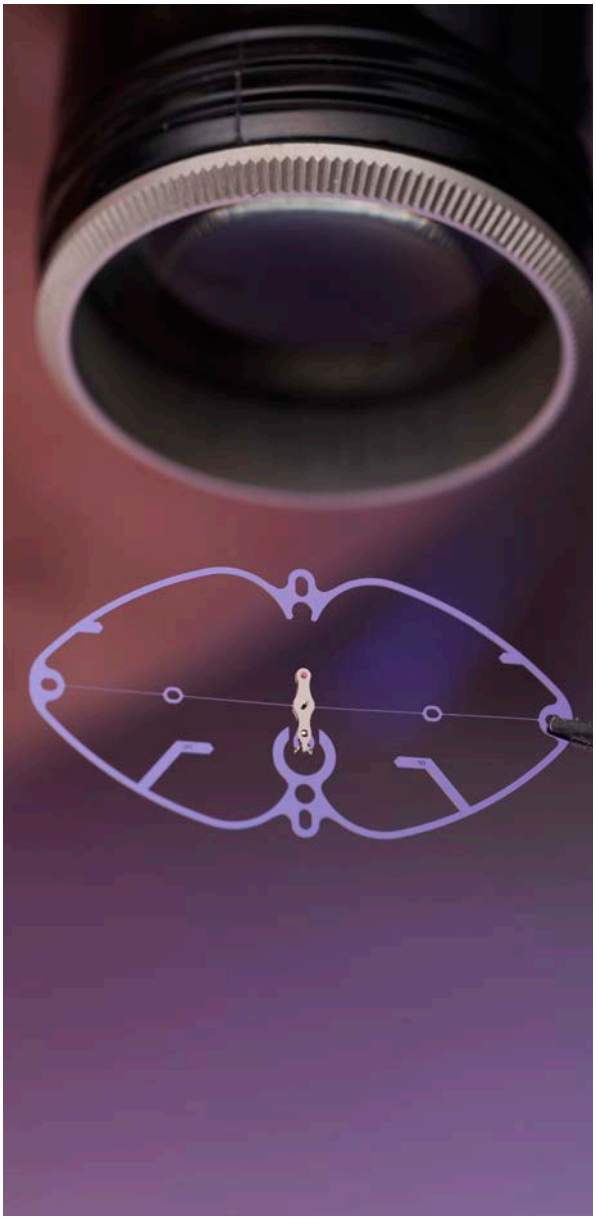
It all began with a train journey

The idea for the silicium blade can be traced to a train journey when an inventive watchmaker held a train ticket between his forefinger and thumb and made several observations.

When a train ticket is flexed it assumes a 'C' shaped form and becomes unstable, a scenario termed 'buckling'. Lateral pressure will cause the card to accumulate a uniform amount of energy up to a point of instability before snapping back, effectively creating an inverted-C-shaped profile. It's this dynamic behaviour of switching from a state of compression to that of bending that lies at the heart of the Constant Escapement.

Unlike most conventional watches, the movement within the Neo Constant Escapement features a 'fifth wheel' connected to the gear train. The fifth wheel transfers energy to two escape wheels, each fitted with three teeth, matching the frequency of the movement (3Hz). Energy is received from the escape wheels alternatively ie not simultaneously. Thereafter, the energy is sent via a rocking lever to the buckling silicium blade. The Constant Escapement exploits the 'elastic and bi-stable' properties of the buckling silicium blade. Six times thinner than a human hair, the blade engages with a lever that serves an impulse to the balance wheel. This precisely choreographed performance features 20 sequences per oscillation. It's a highly inventive arrangement that delivers constant force and ensures the amplitude always remains consistent. The symmetrical shape of the blade and the positioning of the escape wheels either side of the balance wheel ensure the forces act upon the centre of the regulating organ to bestow a smooth rotational motion, free of any impediment.
This unusual and highly inventive configuration proffers extraordinary rate stability and chronometric performance.

When the watchmaker sought backing for his idea, he found a receptive audience in the form of Luigi Macaluso, the Chairman of Girard-Perregaux at the time. The Manufacture was willing to support the inventor in his dream of making the Constant Escapement a reality.



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An ultra-fine silicium blade made possible by DRIE

The advent of DRIE (Deep Reactive Ion Etching), back in the 1990s, provided Girard-Perregaux, working in collaboration with specialist firm Sigatec, with the means to make a silicium blade. To provide context, this blade has a thickness of just 14 microns, six times thinner than a human hair.

Founded in 2006, Sigatec is a trusted partner of Girard-Perregaux and a leading producer of silicium components for the watch industry. Sigatec is jointly owned by Sowind Group (Girard-Perregaux's parent company) and Mimotec, a leading name in UV-LIGA technology.

Sigatec's production facility includes a clean room where parts are produced in a controlled environment in order to mitigate the risk of product contamination. The specialist firm has conducted numerous product trials, experimenting with different shapes, coatings and sizes, to achieve the perfect result.

Silicium is extracted from silica by using electrometallurgy and subsequently formed into highly pure silicium crystals. The cutting-edge material is light, not liable to corrode and friction free, all of which are useful attributes in the field of watchmaking. The material can be formed into intricate shapes that are not achievable using traditional milling or stamping techniques. In this instance, Girard-Perregaux has exploited the high elasticity of silicium, the only material that allows the blade to repeatedly buckle and, in so doing, serve the balance with a constant force.

The silicium blade – the manufacturing process

The making of the silicium blade takes place in a laboratory setting. A large silicium crystal is cut into very thin discs, termed 'wafers'. A technique called 'photolithography' is used to impart geometric shapes onto the wafers.

- The silicium wafer is bonded to a silicium support courtesy of an oxidation layer. The depth limit of the material can be ascertained during the subsequent etching phase.

- Whilst rotating the wafer at high-speed, a liquid polymer, called 'photoresist', is applied to the surface. The centrifugal action caused by rotating the wafer displaces surplus liquid leaving a smooth, thin and uniform layer of the resin material.

- A mask, formed in the shape of the escapement spring, similar to a stencil, is positioned on top of the wafer and then everything is subjected to an intense treatment of UV-light. A chemical reaction then takes place and, thereafter, a special solution is used to remove any residues of the photoresist.

- After it is cleaned, the surface of the wafer reveals a series of escapement springs. These are cut from the wafer using an etching process called DRIE (Deep Reactive Ion Etching). The technique, effectively 3D printing in reverse, removes the silicium and resin, micro-layer by micro-layer, until it reaches the aforementioned oxidation layer.

- The silicium support and oxidation layer are removed using a 'stripping' process. Thereafter, the wafer is subjected to thermal treatment, a step that creates an oxidation layer onto the silicium components. This improves the component's mechanical resistance and endows it with a specific colour, in this instance, the hue appears to transition from blue to purple. Each escapement spring, with its buckling blade positioned centre stage, is carefully detached by hand from the wafer.

- The resultant escapement spring is 120 microns thick, while the blade is a mere 14 microns wide. By comparison, a human hair is typically 50 – 90 microns in thickness.

- When making conventional hairsprings, it is possible to fit 500 pieces on a single wafer. With the Constant Escapement, a wafer can only accommodate 30 escapement springs, heightening productions costs.

A new design language. A familiar approach.

The Neo Constant Escapement does not resemble any other watch, however, it does share some of its genes with other contemporary members of the Bridges collection.

The dial sits beneath a sapphire crystal 'box', a feature that invites light to flood the display while granting lateral views of various dial elements.

Back in 2013, the Constant L.M. featured an off-centre dial indicating the hour and minutes, however, with the Neo Constant Escapement, the hands emanate from the middle of the dial.

Skeletonised dauphine-style hour and minute hands, featuring rhodium treatment, articulate the prevailing time and, courtesy of luminescent material, remain visible in restricted light. A black track, positioned on the flange, is endowed with white markings and incorporates prominent, luminescent hour markers that arc outwards, seemingly floating above the main dial area. The watch is equipped with a central sweep seconds hand that features a sky-blue tip as well as an arrow-shaped counterweight, a detail inspired by Constant's famous gold bridges of 1889.

With the advent of the Neo Constant Escapement, Girard-Perregaux has conceived a new approach to watch design. The resultant timepiece, housed in a Grade 5 titanium case, is light, attractive and surprisingly wearable, especially considering its mechanical complexity. The movement, especially the escapement spring with its unique buckling blade, is clearly functional, but it also contributes to the aesthetic allure of the model. Indeed, its symmetrical appearance resonates with Girard-Perregaux, a Maison synonymous with the legendary three Bridges and the Laureato's octagonal shaped bezel.

Two large barrels sit in the upper half of the dial. The movement is dressed in a combination of black PVD and anthracite NAC. These treatments imbue the dial with a modern appearance while at the same time the execution encompasses ultra-refined finishing, inspired by Haute Horlogerie.

A linear power reserve indicator, positioned at 9 o'clock, reveals how much energy is held within the twin barrels. The movement, the Calibre GP09200, has a linear power supply of at least 7 days. The design of the Neo Constant Escapement allows the wearer to see partial views of the motion works, a theme of disclosure that extends to the escapement spring, the balance, the escape wheels, etc.

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The Neo Bridge

In this instance, the escape wheels are supported by two independent bridges, presented in a stealthy-shade of black, each held in position with a gleaming screw. The design of the bridges was inspired by the famous bridges of the 19th century, but now executed in a modern style. Located underneath, a separate Neo bridge spans the base of the dial and supports the balance wheel.

A 45mm case in Grade 5 titanium

Formed of Grade 5 titanium, the case measures 45mm in diameter at its widest point, making it smaller than its forebears. Moreover, the sides of the intricately formed case taper inwards, both towards the sapphire crystal 'box' as well as near the sapphire caseback. These narrower areas measure between 42.5mm, a modest figure for a watch of such complexity. Moreover, the sense of scale is reduced further with the lugs which curve sharply downwards, making the watch appear smaller on the wrist than the stated dimensions would suggest.

Girard-Perregaux selected Grade 5 titanium for the array of benefits it offers. The alloy is light, corrosion-resistant, strong and hypoallergenic. However, Grade 5 titanium is very hard, making milling more challenging. In this instance, the lugs, bezel and case are formed from a single piece of the alloy, adding another degree of complexity to producing the housing. The extraordinary hardness of Grade 5 titanium means polishing the alloy proves very difficult, a fact that makes the contrasting polished and satin finished surfaces (straight and circular) on this watch even more remarkable. This idea of juxtaposing two contrasting finishes even extends to the fluted crown.

The calibre GP09200

The reverse of the watch, visible via the aforementioned sapphire caseback, reveals more of the hand-wound movement, the Calibre GP09200. Purists will note the symmetrical design of the dial also extends to the verso view of the movement with twin barrels at the top and two Neo Bridges at the base. The repeated use of symmetry and the presentation of functional parts as aesthetic features is a characteristic that has come to define members of the Bridges collection.

Watch aficionados will note that the silver-toned gear train, visible to the rear of the watch, is freely disclosed and stands out from the adjacent black movement components. Likewise, the rear of the escapement spring, escape wheels and balance wheel can be viewed at close quarters, allowing the wearer to view the parts in motion and appreciate the movement's ultra-refined finishing.

A rubber strap unites the Neo Constant Escapement with the wearer's wrist. It features a fabric effect and secures to the wrist with a titanium triple folding buckle with micro adjustment. This latter system features a pusher that slides along a metallic piece endowed with six notches, allowing the owner to fine-tune the strap for optimum comfort.

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Always inventive

An inventive mindset is a defining characteristic of the Maison. It embraces the idea of innovation, imagining new mechanisms that advance horology. The Neo Constant Escapement proves no exception. This latest evolution of the Constant Escapement incorporates several new technologies. Indeed, 30% of the patents employed on this latest model, 13 in total, are new. The new movement features fewer components than the 2013 model (266 compared with 280 parts previously), a clear example of optimisation over complexity.

Examples of the patents employed include: "Improvement of the power reserve and efficiency of the escapement", "Improvement of the chronometry and the efficiency of the balance wheel" or "Complete angular locking of all sequences of the escapement".

In the spirit of continuous improvement, Girard-Perregaux will be filing further patents covering an array of additional innovations. These relate to the geometry of components that facilitate the automatic starting of the movement as well as the shape of further parts that enhance the efficiency of the escape wheel.

The Neo Constant Escapement, a tribute to Constant

Since 1791, Girard-Perregaux has grown due to the hardwork and inventive ideas of numerous men and women, however, one individual in particular has left an indelible mark on the Maison, Constant Girard. He was a highly gifted watchmaker who united the worlds of mechanics and aesthetics, leaving a legacy that remains relevant today.

The Neo Constant Escapement perpetuates the Maison's heritage, combining the mastery of energy with a unique aesthetic that respects the past but embraces the present and the future.

Patrick PRUNIAUX,
CEO of Girard-Perregux, comments

"The Constant L.M was a remarkable watch, something that was recognised with the award of the GPHG 'Aiguille D'Or' in 2013. It is now part of our Maison's patrimony, however, we did not want to leave it on the shelf gathering dust. On the contrary, we wanted to build on our know-how, push the performance envelope and make an up-to-the-minute evolution of the original concept. The Neo Constant Escapement is superior in every way. It stands testament to the dedication of our talented team and represents a new era in watchmaking."

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The model goes on sale in January 2024 and will be available worldwide in all authorised Girard-Perregaux retailers. However, by virtue of its protracted creation, the Neo Constant Escapement will be produced in limited quantities, conferring a notable degree of exclusivity.

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ABOUT GIRARD-PERREGAUX

Since 1791, Girard-Perregaux has been embracing the rhythm of ever-elusive time. Cradled in the Jura mountains in the heart of La Chaux-de-Fonds, it is a pioneer in the world of Haute Horlogerie: an independent Manufacture which has retained this status for over two centuries, successfully keeping all production in-house and passing down exceptional horological skills throughout the generations. The preservation of this savoir-faire, along with a sincere passion for beauty and for the art itself, has remained the key to Girard-Perregaux's ability to continuously innovate.

Always seeking the perfect balance of beauty and functionality, fans of fine watchmaking will instantly recognise the house signatures, such as the iconic octagonal bezel of the Laureato and the legendary Tourbillon with 'Three Gold Bridges'. From seeking to create industry references in timepieces to making the invisible visible through the art of precision engineering, Girard-Perregaux never ceases to change the course of time via pieces that are the first of their kind. This place at the vanguard of horological innovation is solidified by over one hundred recorded patents for original designs, like the movement of three arrow-shaped bridges, registered in the USA in 1884, as well as prizes like the 'Aiguille d'Or' in 2013 and distinctions like the Gold Medal at the Paris Universal Exhibition in 1889.

Rooted in its heritage, Girard-Perregaux is driven by the instinct to always look ahead, embracing new technologies, utilising state-of-the-art materials, and finding inventive ways to bring joy by reimagining iconic shapes. To this end, Girard-Perregaux has remained a human-sized Manufacture, and in 2022 became part of an independent collective of Haute Horlogerie Manufactures alongside sister Maison Ulysse Nardin.

Girard-Perregaux press contacts:

Leopoldo Celi
Head of Communication and Brand Image

E-mail: leopoldo.celi@girard-perregaux.com
Téléphone: +41 (0)79 303 50 72

Capucine Abrysch
PR & Media Project Manager

E-mail: capucine.abrysch@girard-perregaux.com
Téléphone: +41 (0)79 340 99 03

www.girard-perregaux.com/press

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TECHNICAL SPECIFICATION

NEO CONSTANT ESCAPEMENT

Reference: 93510-21-1930-5CX
Suggested Retail Prices: GBP 84'700 / CHF 95'000 / USD 99'600 / EUR 105'000

Case
Material: titanium
Diameter: 45.00 mm
Height: 14.80 mm
Glass: sapphire anti-reflective 'box'
Case-back: sapphire crystal
Dial: ring displaying suspended indexes with
luminescent material (blue emission)
Hands: skeletonized, rhodium-plated, 'dauphine' type with luminescent material (blue emission)
Water resistance: 30 meters (3 ATM)

Movement
Reference: GP09200-1153
Hand-wound mechanical movement
COSC-certified Chronometer
Diameter: 39.50 mm (171/2''')
Height: 7.40 mm
Frequency: 21,600 Vib/h – (3 Hz)
Number of components: 266
Number of jewels: 29
Power reserve: min. 7 days
Functions: Hours, minutes, central seconds, power reserve indicator

Strap
Material: black rubber strap with fabric effect
Buckle: titanium triple folding buckle with micro-adjustment system

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