PATEK PHILIPPE
GENEVE

Press Release

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Ref. 5470P-001 1/10th Second Monopusher Chronograph
Patek Philippe unveils its first wrist chronograph for tenths-of-a-second short-time measurements with a new, very precise high-performance movement.

The manufacture reasserts its competence and innovative spirit in the field of short-time measurement: it presents a manually wound movement with two separate chronograph mechanisms and sweep hands. One of them indicates tenths of a second – precisely and very crisply. This high-tech high-frequency caliber (5 Hz) with 31 patents, of which seven new patents are specific to the new mechanism, ticks in a platinum case with a blue dial and red accents. Its sporty design emphasizes the highly technical and performance-oriented facets. With this tenth-of-a-second monopusher chronograph produced in small series – it is just as difficult to craft as a tourbillon, a minute repeater, or a split-seconds chronograph – Patek Philippe is delighting connoisseurs and enthusiasts with a new attraction in the domain of grand complications.

At Patek Philippe, chronographs have a rich, long-standing tradition. Since 1856, the manufacture has stood out with the sublime assets of its pocket chronographs with or without rattrapante hands, often in combination with other complications such as perpetual calendars or minute repeaters. In ca, 1930–1931, the manufacture even developed a pocket watch with a tenth-of-a-second chronograph; today, it can be admired in the Patek Philippe Museum (Inv. P-340). As early as 1923, in response to a commission, Patek Philippe had already crafted its first split-seconds chronograph. This single piece was followed starting in 1927 by the first regularly produced wrist chronographs with or without rattrapante hands, among them the legendary Ref. 130 which was made from 1934 onward to the early 1960s.

The first decades of the third millennium were particularly prolific in the field of short-time measurement. As from 2005, Patek Philippe developed an extensive suite of chronograph movements with and without additional complications (rattrapante hands, minute repeaters, perpetual calendars, Annual Calendars, World Time) that were all designed and crafted in the manufacture's ateliers. These chronograph movements feature numerous innovations and patented optimizations. Today, they are embedded in a regular collection with over 20 different models for ladies and gentlemen.

A condensate of mechanical achievements

To further push the boundaries of mechanical horology and delight the aficionados of highly technical timepieces, Patek Philippe decided to develop its first movement for a wrist chronograph that can measure and display tenths of a second. For this purpose, the engineers relied on one of the in-house

PATEK PHILIPPE SA GENEVE
Chemin du Pont-du-Centenaire 141 – 1228 Plan-les-Ouates
P.O. Box 2654 – CH – 1211 Geneva 2 – Switzerland
Tel. + 41 22 884 20 20 – Fax + 41 22 884 25 47 – www.patek.com

movements that had been developed during the past twenty years. It was the caliber CH 29-535 PS launched in 2009; it reflects traditional architecture (manually wound, column-wheel control, horizontal wheel clutch) enhanced with six patented innovations and is complemented by its split-seconds version with two sweep chronograph hands (CHR 29-535 PS).

The first task was to increase the frequency of the movement. With a frequency of 4 Hz (28,800 semi-oscillations per hour that let the movement and the chronograph hands execute 8 jumps per second), the caliber CH 29-535 PS can merely measure eights of a second. Conversely, the new caliber CH 29-535 PS 1/10 beats at a frequency of 5 Hz (36,000 semi-oscillations per hour for 10 jumps per second) and thus allows the measurement of tenths of a second. This is a premiere for a Patek Philippe wrist chronograph but it also requires more energy.

But a sweep seconds hand alone and a frequency of 5 Hz would not be sufficient to display tenths of a second with the desired accuracy. The dial of a wristwatch does not provide enough space for a scale with a microscopically tight tenths-of-a-second graduation. The designers thus resolved to provide the caliber CH 29-535 PS 1/10 with two independent chronograph mechanisms: one for the seconds and the instantaneous 30-minute counter, the other exclusively for measuring and displaying stopped tenths of a second.

A patented concentric display

With this decision, Patek Philippe opted for good legibility. In keeping with the manufacture's customer-centric creation philosophy, it was essential to assure the ideally organized, fast and dependable readability of the tenths of a second, the seconds, and minutes of the chronograph.

The engineers therefore conceived a patented system that displays the measured seconds and the fractions of a second concentrically. The watch features two sweep chronograph hands, each of them driven by an independent mechanism. The hand that performs a complete revolution per minute shows the stopped seconds in the traditional manner. The other hand (lacquered red in the new Ref. 5470P-001) performs one revolution per 12 seconds, i.e. five times faster than an ordinary chronograph hand and sweeps across 12 sectors subdivided into tenths. In this way, the user can immediately read the elapsed seconds guided by the pearl markers and then, on the outer railway track scale, read the number of elapsed tenths of a second departing from the last red marker. The minutes of the short-time measurement are displayed by the instantaneous 30-minute counter on the subsidiary dial at 3 o'clock.

Given so much simplicity in use, the patented system's heart is a true treasure chest of ingenious solutions in the movement but out of sight. As usual, Patek Philippe raised the bar and specified that the new caliber should meet ambitious requirements in every respect. The watch should not only be able to measure and display tenths of a second but also retain this precision during a 30-minute run of the chronograph. Additionally, the caliber CH 29-535 PS 1/10 had to be built as compactly as possible while retaining the diameter of the base caliber (29.6 mm) and allowing only a slight height increase (from 5.35 mm to 6.96 mm) – despite the two chronograph mechanisms and a total of 396 parts. As a true

accomplishment in miniaturization, this new movement is even shorter than the rattrapante caliber CHR 29-535 PS (7.1 mm).

Energy control and high precision

The Patek Philippe Grand Complication thus created is as complex as a tourbillon, a minute repeater or a split-seconds chronograph. For the frequency of 5 Hz and the integration of a second chronograph mechanism with a high-speed hand, the new caliber CH 29-535 PS 1/10 requires considerably more energy. To master and limit this energy appetite, the engineers had to intervene at all nooks and crannies of the movement. And of course, the term “precision” dominated the entire development of the movement.

The challenge began with a single mainspring that was needed to provide energy for the whole movement. Patek Philippe reworked this component and increased its efficiency to preserve the amplitude of the balance spring as much as possible and to assure optimized rate stability. To increase the available energy and boost the power reserve, the diameter of the barrel arbor was reduced and the number of mainspring coils increased. A patented notch reduces the tension of the slip bridle during the winding process, thus eliminating the risk of damage due to the increased force.

A high-tech regulator mechanism

To handle the three challenges – efficiency, reliability, and rate accuracy – Patek Philippe decided to use its Oscillomax® ensemble that had been developed by the “Patek Philippe Advanced Research” department. This high-tech regulator mechanism was presented in 2011, was granted 17 patents, and has three innovative components that rely on all advantages of the Silinvar® technology – it is based on a derivative of silicon with extraordinary physical and mechanical characteristics (lightweight, rugged, antimagnetic, etc.). The ensemble operates with a Spiromax® balance spring with a patented terminal curve and an inner boss (patent granted in 2017, Ref. 5650), a Pulsomax® escapement consisting of a lever and escape wheel with extensively reworked geometries as well as a Gyromax® balance in Silinvar® with gold inlays. This is the first time since the launch of the perpetual calendar “Patek Philippe Advanced Research Ref. 5550P“ (2011) that Patek Philippe has added the Oscillomax® ensemble in its current collection. But this decision plays a decisive role for the exceptional performance of the new caliber CH 29-535 PS 1/10 movement. And it enables the high rate accuracy with a maximum deviation of -3/+2 seconds per day specified by the Patek Philippe Seal – despite the clearly higher energy consumption of the movement.

Fluid and perfectly synchronized hand movements

Another big challenge arose during the development of the caliber CH 29-535 PS 1/10 regarding the quality of the display, particularly of the tenths of a second. The two chronograph displays must be perfectly synchronized. Despite the high speed of rotation, the tenth-of-a-second hand must move fluidly

without jumps or vibrations. Here, too, the manufacture's engineers developed and implemented innovative solutions.

The mechanism for displaying the tenths of a second receives its energy via a driving wheel from the fourth wheel of the base movement. Patek Philippe designed the driving wheel in a novel two-part arrangement: the upper wheel with flexible spokes, the lower one with rigid spokes. Thanks to this patented anti-backlash principle that is both compact and energy-saving, the teeth of the driving wheel exert an elastic force on the clutch wheel, eliminating any risk of hand vibration.

As soon as the chronograph is started, the tenth-of-a-second driving wheel (with one revolution per minute) engages with the tenth-of-a-second pinion that performs one revolution in 12 seconds (turning five times faster). To enable this "acceleration", Patek Philippe provided the tenth-of-a-second pinion with microtoothing: 136 teeth on a pinion diameter of 1.469 mm and with a tooth height of 30 µm. The pretensioning force exerted by the clutch wheel on the pinion suppresses tooth backlash. Many individual measures maximize the accuracy of the display.

A proven shock absorber

Another indispensable measure needed for a user-centric solution relates to the shock absorber. The new caliber CH 29-535 PS 1/10 had to handle all requirements and risks to which it would be exposed in daily use. For this purpose, Patek Philippe developed two patented mechanisms. One of them is a shock absorber hook that would secure the clutch rocker during the entire short-time measurement process. The second one uses the "unbalances" (centers of gravity, not to be confused with centers of rotation) of components of the mechanism for the tenths-of-a-second chronograph. In the event of a shock, the acceleration values of the components exposed to it are compensated instead of being cumulated. The result is that all components remain in the desired positions, eliminating any impact on the correct function of the watch.

A monopusher chronograph

The last notable feature: The chronograph has a single pusher at 2 o'clock that successively executes the start, stop, and reset commands. This monopusher arrangement recalls the classic chronographs and will delight the aficionados of technical timepieces. In addition to the patented special features of the caliber CH 29-535 PS 1/10, the new watch embodies the seamless pairing of tradition and innovation that constitutes the core of the Patek philosophy.

The sapphire-crystal case back (interchangeable with the solid platinum back delivered with the watch) affords a spectacular view of the caliber CH 29-535 PS 1/10 with its filigreed components and the elaborately executed finissage (bridges with chamfered and polished edges, Geneva striping, etc.). The engraved, gilt inscriptions "Oscillomax 5 Hz" and "GyromaxSi" on the bridges refer to the innovative movement components.

A resolutely sporty style

A movement dedicated entirely to performance and short-time measurements needs to be well protected so Patek Philippe created an inimitably sporty exterior. To case this condensate of technical prowess, the manufacture chose platinum, the most precious metal but also the most difficult one to machine. The gently rounded case has the same design as the manually wound Ref. 5370 Split Seconds Chronograph launched in 2015. As a special feature, it has a concave bezel that forms a perfect transition to the slightly domed sapphire-crystal glass The case flanks are slightly recessed and satin-finished, the lugs are subtly curved and feature decorative cabochons at the ends of the spring bars. Like all of Patek Philippe's platinum models, the Ref. 5470P-001 is adorned with a flawless brilliant-cut diamond between the lugs at 6 o'clock.

The elegant blue of the dial harmonizes exceptionally well with the shimmering reflections of the platinum case, at the same time offering the perfect contrast for the crisp legibility of the individual displays. The chronograph seconds are indicated with a sandblasted and rhodiumed steel hand on a minute scale with small gold pearls. The tenths of a second are displayed with a slender hand in Silinvar®. Because it is so lightweight, the high-tech material saves energy but has the rigidity needed to withstand the shock that occurs when the chronograph is abruptly stopped. Thanks to a new patented process for decorating the Silinvar® hand, in this case lacquered red, and a second patent concerning the attachment of the pipe to the Silinvar® hand by brazing, Patek Philippe succeeded for the first time in using the promising material for external features of a watch. The red color of the hand is also echoed on the markers of the railway-track scale for reading tenths of a second. As long as the chronograph is not operating, the red and gray chronograph hands are superposed and look like a single hand. Once a short-time measurement has been started with the pusher at 2 o'clock, it launches its fascinating ballet with two separate rotation speeds. The instantaneous 30-minute counter at 3 o'clock and the small seconds at 9 o'clock have crisp railway-track scales to improve the legibility of the respective information.

The new 5470P-001 is worn on a navy blue calfskin strap with an embossed fabric pattern and red decorative seams in perfect harmony with the colors of the dial. Its fold-over clasp in platinum assures comfort and safety on the wrist.

The seven patents of the new caliber CH 29-535 PS 1/10 movement

• **Concentric display** (Patent WO2012104688A1)
This display mode based on two sweep hands assures simple, swift, and safe legibility of seconds and fractions of a second.

• **Notch in the barrel arbor** (Patent WO2017005394A1)
The addition of this notch reduces the tension on the spring hook while the mainspring is being wound. It also allows a smaller diameter of the barrel arbor, increasing the energy stored in the mainspring by further spring coils.

• **1/10 driving wheel with anti-backlash feature** (European patent application EP3042250A1)
This design on two levels (an upper wheel with flexible spokes and a lower one with rigid spokes) allows the creation of an anti-backlash wheel that is compact and consumes little energy.

• **Chronograph with shock-absorber hook** (Patent WO2015173372A2)
In the event of a shock, this system securely holds the clutch rocker of the operating chronograph mechanism to prevent disruptions of the ongoing short-time measurement.

• **Pendulum shock absorber** (Swiss Patent CH713473A2)
This system utilizes the acceleration forces of shocks on the watch to keep the components of a mechanism in the desired position and thus to assure correct functionality.

• **Surface primer for the silicon hand (**European patent application EP3764167A1)
With a fine primer coating (e.g. PVD or CVD), this process improves the adhesion of lacquer on a silicon-oxide surface (Silinvar®).

• **Assembly process for watch components** (European patent EP 3309624 B1)
Thanks to a multi-layer metal coating, this process for joining two base materials, one of which non-metallic, allows the pipe of a Silinvar® hand to be brazed.

These patents are complemented by the six patented innovations for the caliber CH 29-535 PS introduced in 2009, the 17 patents for the development of the high-tech Oscillomax® ensemble (2011), and the patent for the optimized Spiromax® balance spring with a terminal curve and an inner boss (2017).

As a veritable concentrate of innovations, the new caliber CH 29-535 PS 1/10 unites a total of 31 inventions developed and patented by Patek Philippe – all in the first twenty years of the 21st century

Technical data

Ref. 5470P-001 1/10th Second Monopusher Chronograph

Movement:	Caliber CH 29-535 PS 1/10 Manually wound mechanical movement, chronograph with column-wheel control, horizontal dual clutch with wheels and instantaneous 30-minute counter, module for tenths-of-a-second measurements of the chronograph with sweep hand, small seconds
Diameter:	29.6 mm
Height:	6.96 mm
Number of parts:	396
Number of jewels:	38
Power reserve:	Min. 48 hours (with chronograph switched off)
Balance:	Gyromax® in Silinvar® with inlays in 99.9% gold
Frequency:	36,000 semi-oscillations per hour (5 Hz)
Balance spring:	Spiromax® in Silinvar®
Escapement:	Pulsomax® with lever and escape wheel in Silinvar®
Balance spring stud:	Adjustable
Functions:	2-position crown – Pushed in: To wind the watch – Pulled out: To set the time and stop seconds
Displays:	Center hour and minute hands Chronograph hand and tenths-of-a-second chronograph hand from the center 30-minute counter at 6 o'clock Subsidiary seconds at 9 o'clock
Pushers:	Chronograph start, stop, and reset at 2 o'clock
Hallmark:	Patek Philippe Seal

Features

Case:	950 platinum Sapphire-crystal case back and interchangeable solid platinum back Flawless rare white Top Wesselton diamond between the lugs at 6 o'clock Water resistant to 30 m (3 bar)

Case dimensions:	Diameter: 41 mm Height (crystal to display back): 13.68 mm
Dial:	Brass, lacquered blue Applied Breguet numerals in 18K white gold and minute pearl markers Railway track scale printed white and red (minutes, snailed small seconds at 9 o'clock, snailed 30-minute chronograph counter at 3 o'clock) Leaf-shaped hour and minute hands in 18K white gold with luminous coating Small seconds with sword hand in 18K white gold Chronograph hand, sandblasted steel, rhodiumed Tenths-of-a-second chronograph hand in red lacquered Silinvar® 30-minute counter with sword hand in 18K white gold
Strap:	Calfskin with embossed fabric pattern, hand-stitched, navy blue with red contrast seams, fold-over clasp in 950 platinum