
FROM NOW TO ETERNITY

More than 40 years ago, Kurt Klaus developed his legendary perpetual calendar, which has continued to set the bar for efficiency and user-friendliness to this day. Its appearance marked the start of IWC Schaffhausen's accumulation of a singular body of expertise in mechanical calendars. In the Portugieser Eternal Calendar, the company now presents its first secular perpetual calendar. Its mechanical program automatically accounts for the anomalies of the Gregorian calendar by skipping a leap year three times over a period of four centuries. In addition, the moon phase is so precise that it will deviate by only one day after 45 million years. With this functional and technically elegant complication, IWC once again underscores its unique engineering approach to fine watchmaking.

The Gregorian calendar, which goes back to Julius Caesar's Julian calendar, has many anomalies. So many, that mnemonics have been devised to help children master them. These range from rhymes like: "Thirty days hath September, April, June, and November. When short February's done All the rest have 31..." to counting the months using knuckles.

However, there is more to it than knowing that the months have 28, 30, or 31 days. Every four years, we have to insert a leap day on 29th February to correct the deviation from the solar year that has accrued during that time. And it does not stop there. Since Pope Gregory XIII's calendar reform of 1582, we need to observe additional rules: only those centuries divisible by 400 without a remainder are leap years. At the beginning of all the other centuries, such as 2100, 2200, or 2300, the leap year we would normally expect is omitted.

The chapter that gave IWC Schaffhausen's history a decisive turn began in the late 1970s. At the height of the quartz crisis in the Swiss watch industry, the then-head watchmaker Kurt Klaus decided to develop a mechanical perpetual calendar for a wristwatch.

At that time, such calendars were usually permanently linked to the movement, comprised an enormous number of parts and had displays that had to be set manually using pushers on the case. Klaus set out to build a module that could be mounted on various basic movements. His calendar would also set new standards in simplicity and user-friendliness. In line with the vision of IWC

founder F.A. Jones, Klaus also focused on the possibility of industrial production and assembly on the production line at an early stage.

His perpetual calendar finally celebrated its premiere in 1985 in the **Da Vinci Perpetual Calendar Chronograph** (Ref. IW3750). The ingeniously simple mechanism, containing just 81 parts, was driven by a single switching impulse from the basic movement during the night. However, the innovation that set the mechanism apart was the perfect synchronisation of all the displays, from the date to the day of the week, the month and the moon phase to the year. If the watch has not been worn for a while and stops running, all the displays can be simply advanced together using the crown. It was also one of the first perpetual calendars with a four-digit year display and featured a high-precision moon phase that required a manual correction of just one day after 122 years.

The perpetual calendar's essential functions have remained unchanged since the 1980s, but IWC has continued to improve the mechanism. Another milestone was the introduction of the **Portugieser Perpetual Calendar** (Ref. IW5021) in 2003, which incorporated the calendar module into the large 5000 calibre. The increased space made room for the integration of a new moon phase reduction gear and boosted the display's precision from a one-day deviation in 122 to 577.5 years. The Portugieser Perpetual Calendar was also the first watch from IWC to feature the innovative Double Moon™ display, which shows the moon's current phase as it appears to viewers in both the Northern and Southern hemispheres.

With the **Portugieser Eternal Calendar** (Ref. IW505701), IWC takes the synchronisation concept to a whole new level and unveils its first secular perpetual calendar. Significantly, this calendar also allows for the Gregorian calendar's complicated leap year exception rules and automatically omits three leap years over a period of four centuries. The calendar will, therefore, display the leap year correctly until at least the year 3999. An official decision on whether the year 4000 will be a leap year is still pending.

As in a conventional perpetual calendar, the centrepiece of the mechanical program is the "month cam wheel". The wheel integrates a four-year cycle of 48 months, in which three regular years of 365 days are followed by a 366-day leap year. The recesses on the wheel are of different depths and indicate the varying lengths of the months. A feeler progresses across the indentations, transmitting information to the calendar about the number of days in the current month. Kurt Klaus' perpetual calendar obtains the information exclusively from this program. It therefore adds a leap day every four years at the end of February and will require a correction in 2100 because the leap year that would normally be due is cancelled due to the exception rule.

The situation is different with the Portugieser Eternal Calendar. At the point where the information for 29th February would normally be coded on the month cam wheel, there is an aperture. Every four years, the feeler has access to an additional mechanism. At the heart of this is a 400-year wheel that completes a full revolution only once every four centuries. There are three indentations with the information for 28 days. If the feeler falls into one of these indentations, as it will in the years 2100, 2200, and 2300, the calendar cancels the leap year. In all other years, the feeler senses the raised position, and the leap year occurs normally. This will be the case 97 times within 400 years; in other words, also in those centuries divisible by 400, which therefore count as leap years.

The century module is driven indirectly by the month cam wheel itself. Every four years, it advances a five-arm Maltese wheel by one position. When 20 years have elapsed, this wheel, in turn, moves the 400-year wheel, which has 20 teeth. This additional mechanism, which transforms the Julian calendar into a Gregorian one, is impressively simple and efficient. It comprises just eight individual parts and further underscores IWC's unique engineering approach to fine watchmaking.

For the Portugieser Eternal Calendar, IWC's engineers set about developing a moon phase display with unprecedented precision. Positioning the moon phase on the dial of a mechanical watch is difficult because the moon does not follow a daily rhythm as it orbits the earth. The cycle from one new moon to the next – a lunation – does not last 30 days, but exactly 29.530589 days, or approximately 29 days, 12 hours, 44 minutes and 2.88 seconds. Those 30 days need to be reduced to come as close as possible to the duration of a lunation.

This is achieved by placing a reduction drive between the day star and the moon phase disc. The key to high accuracy lies in the number of gears, their proportions, and the number of teeth. For the Portugieser Eternal Calendar, IWC designed a new reduction gear with three intermediate wheels. In purely mathematical terms, the moon phase mechanism will deviate from the actual lunar orbit by only one day after 45 million years. Reaching this level of accuracy involved calculating more than 22 trillion different combinations using a specially developed computer simulation program. Another challenge was that the new moon phase module could not take up more space in the movement than the previous solution. In addition, the shapes of the teeth had to be optimised to ensure maximum functional reliability, even over extremely long periods of time.

Of course, an accuracy of one day in 45 million years is purely theoretical. By then, many factors influencing our universe – such as the length of days or the distance between the moon and the earth – will have changed fundamentally. However, it is in the nature of engineers to go to the limits of what is technically feasible. And sometimes even a little beyond.

IWC SCHAFFHAUSEN

IWC Schaffhausen is a leading Swiss luxury watch manufacturer based in Schaffhausen in the north-eastern part of Switzerland. With collections like the Portugieser and the Pilot's Watches, the brand covers the whole spectrum from elegant to sports watches. Founded in 1868 by the American watchmaker and engineer Florentine Ariosto Jones, IWC is known for its unique engineering approach to watchmaking, combining the best of human craftsmanship and creativity with cutting-edge technology and processes.

Over its more than 150-year history, IWC has earned a reputation for creating professional instrument watches and functional complications, especially chronographs and calendars, which are ingenious, robust, and easy for customers to use. A pioneer in the use of titanium and ceramics, IWC today specialises in highly engineered watch cases manufactured from advanced materials, such as coloured ceramics, Ceratanium®, and titanium aluminide.

A leader in sustainable luxury watchmaking, IWC sources materials responsibly and takes action to minimise its impact on the environment. Along the pillars of transparency, circularity, and responsibility, the brand crafts timepieces built to last for generations and continuously improves every element of how it manufactures, distributes, and services its products in the most responsible way. IWC also partners with organisations that work globally to support children and young people.

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