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FILENIOS WATCHES

HOROLOGY BASICS



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BASIC INFORMATION ON WATCHES

Watches are highly appreciated all over the world for three basic reasons. First, they are status symbols due to their emotional implication and technical substance. Second, we appreciate their contribution to the evolution of human history as well as the ingenuity of all those watchmakers and managers that have materialized this horological evolution over the last five centuries. Third, lately some of them have proved to be investment items. It is true that the majority of watches bought today are not regarded as “time telling” tools, and this is fully acceptable. However, there is always a market segment interested in watchmaking per se.

Filenios addresses its advising service and watch projects primarily to these people, to informed watch enthusiasts and collectors. Despite the abundant information available in the web, searching and learning is not easy, so I try in this short E-Guide to provide the basics and the necessary orientation in the chaotic global watch market. This material should be helpful both for the new comers, but also for more experienced buyers who try to figure out the usual industry disputes.

The first page timepiece photo coming from a hand painted artistic watch (Filenios collection) is the only one herein. The “eyes of tiger” symbolize the determination of Filenios overall editorial project to contribute in the information and decision making of any watch buyers, enthusiasts, collectors who need proper guidance. The bottom line is that the more we know, the less money we waste in wrong decisions, in a market subjected to the challenging doctrine “if you know, you know”.

This short E-Guide herein includes the following sections:

1. The Time Line
2. How the watch works
3. The spacetime of watchmaking
4. Four Swiss mechanisms
5. Handmade watches
6. Evaluating watches
7. Buying & Collecting watches
8. Using - Maintaining - Servicing watches

Overall, this work is compact, simplified, rather subjective and challenging at some points. The objective is not delivering an E-Book, but motivating and helping the reader to think “out of the box” about this exciting world of watchmaking.

ΦΣ**THE TIME LINE**

Humanity's children count the time generation after generation for more than four thousand years satisfying their need to plan and schedule during their life. The prerequisite to measure time is its division to successive irreversible periods, in other words, we measure units of passing time. The first tool used by the ancient civilizations had been the calendar depending on the movement of the moon and the sun, and naturally the first timekeeping units had been the days, weeks and months. Around 2000 BC, Sumerians invented the sexagesimal numeral system, based on the superior number 60. Later on, in 1500 BC, Egyptians first divided the day into 12 hours using solar obelisk clocks working on the moving shadow effect, and at the same time developed the water clocks (clepsydra), along with Asians, Greeks and Persians. The best device however had been the hourglass or sandglass enabling the timekeeping during the night and remaining in use for more than 3000 years, from the 15th century BC till the development of the mechanical watches in the 16th century AD and beyond.

Without ignoring the potential existence of devices like Antikythera Mechanism (estimated to be constructed around 100 BC), the mechanical horology depending on the use of verge escapements powered by foliot and balance wheel weights, emerged with the first tower clocks in the 14th century counting only hours with a single hand or even with bell ringing. In the early 16th century, Peter Henlein (among others) presented in Nuremberg-Germany one of the first portable single (hour) hand watches, equipped with a miniature torsion pendulum and powered by a metallic coil spring (already invented in the early 15th century). Finally, the experimentation on the regular motion of the pendulum (isochronism) in 1602 by Galileo Galilei, opened the road to the invention of the pendulum clock in 1656 by the Dutch Christiaan Huygens, with great effect on the timekeeping accuracy. At the same period, along with the English Robert Hooke and Thomas Tompion, he worked independently on the invention of the oscillating spiral balance spring, the most critical element for the further development of the mechanical watch in the upcoming centuries.

THE WATCH DEVELOPMENT

- 1505 The German Peter Henlein (among others active in the same period) presents in Nuremberg one of the first portable watches (predecessor of the pocket watch) based on mainspring and miniature torsion pendulum. It has one hand counting only the hours. The production of such watches

starts first in Germany and France before the middle of the century, and later on, circa in 1575, the British and the Swiss follow setting up their own watch industries, based on differentiated principles and practices.

- 1675 Christiaan Huygens, Robert Hooke and Thomas Tompion are credited with the invention of the spring balance (balancier) that improves substantially the accuracy of watches. The third one uses for the first time the dead beat escapement system invented by Richard Towneley the same year. Further on, the watches have a second hand counting the minutes, with adequate accuracy for that period (deviation 5-10 minutes per day). This is perhaps the most important development in the history of watchmaking.
- 1687 The English Daniel Quare secures his patent for the first repeater pocket watch that chimes the time on demand using gongs for separate tones for hours, quarters and minutes. It is considered diachronically the highest complication, optimized by Abraham Louis Breguet in its current form, almost one century later in 1783.
- 1755 The English Thomas Mudge invents the lever escapement further improving the regulator function. The most critical element of the mechanical watch movement gets its most commonly used layout.
- 1761 The English John Harrison presents H4, the first successfully tested marine chronometer having the property of maintaining perfect accuracy onboard a ship, in adverse conditions. Accurate timekeeping is necessary for the exact longitude calculation, and facilitates the development of navigation and sea transportation in the upcoming centuries.
- 1765 The French Jean Antoine Lepine introduces the modern thin form of pocket mechanism, with separate bridges and mainspring barrel allowing for the assembling of smaller and more practical open face pocket watches.
- 1801 Abraham Louis Breguet (1747-1823) patents the first tourbillon escapement mounted in a rotating cage, with the scope of negating the gravity effect and improving the timekeeping accuracy. It is the most impressive invention of his time, a testament of his ingenuity and his contribution in almost all aspects related to hi-end watchmaking. He is regarded as the greatest watchmaker of all times (GOAT).

- 1816 The French Louis Moinet introduces the first pocket chronograph contributing to the development of sports among others.
- 1850 The beginning of the American mechanized industry producing high volumes of qualitative timepieces, coincides with the presentation of the first keyless crown wind and set pocket watches, thanks to the work of Jean-Adrien Philippe and Charles-Antoine LeCoultre, from the 1840s.
- 1876 The Swiss watchmaker Jacques David, after a visit to the US, issues two reports that change the course of the Swiss industry towards its modernization and domination in the 20th century.
- 1884 The world is divided in 24 time zones, with the Greenwich meridian in London being the starting point of every other time zone in the map. Consequently, the first world time watches appeared in the 1930s and the first GMT models with a second hour hand in the 1950s.
- 1893 The American watch industry sets the standards for the railroad grade pocket watches introducing official quality criteria for watch mechanisms of mass production, for the very first time.
- 1895 The invention of Invar Nickel-Iron alloy minimizes the effect of temperature on the spring balance function. The inventor Swiss physicist Charles Edouard Guillaume wins the Nobel prize in 1920.
- 1914 The beginning of WWI is also the beginning of mass production for military "Trench" wristwatches. Up to this time, wristwatches had been produced upon special order, primarily for military purposes since the late 19th century. After WWI and especially during the 1920s and 1930s, the production volume of wristwatches exceeds the respective capacity of pocket watches.
- 1916 HEUER introduces Micrograph, the first mechanical stopwatch breaking the 1/100th second barrier, and becomes the official timekeeper in the Olympic Games of 1920 in Antwerp, 1924 in Paris, 1928 in Amsterdam. It is kept in production for many decades being a grail vintage stopwatch today as well as a great inspiration for contemporary models of the same brand.

- 1921 The American physicist and electrical engineer Walter G. Cady develops the first quartz crystal oscillator opening the road for the presentation of the first quartz clock in 1927 using an oscillator of 50,000 Hz.
- 1926 ROLEX presents the first water resistant case put in production and being publicly available under the name Oyster.
- 1932 ROLEX thanks to the work of Emile Borer patents the first viable mass-produced automatic mechanism, fitted in "Bubbleback" line models, from 1933 to 1955.
- 1933 The invention of Nivarox alloy for the hairspring construction and Incabloc shock protection system a year later, improve essentially the properties of wristwatches.
- 1953 BLANCPAIN, ROLEX and ZODIAC introduce the first diving models, both for military and civilian use, opening the road for the most iconic sport wristwatches diachronically.
- 1960 BULOVA introduces Accutron model after a rival with ELGIN and HAMILTON on electric watches since the early 1950s. Accutron models have replaced the spring balance with a tuning fork oscillating at a frequency of 360Hz, with a theoretical deviation up to 2 seconds per day being the most successful electric watches in the pre quartz era, kept in production for 17 years till 1977.
- 1967 Thanks to the developments on the atomic clock since the 1950s, the scientific community accepts a new definition for the second being equal to the hyperfine structure transition frequency of Caesium-133 atoms (subjected to radiation) that is 9,192,631,770Hz.
- 1969 SEIKO presents Astron, the first commercial quartz watch, accurate +/- 5 sec/month (Cal.35A operating at a frequency of 8.192Hz), after a rival with Beta-21 Swiss project, and sets the beginning of a new era in watchmaking.
- 1972 HAMILTON sub-brand Pulsar presents the first electronic digital (LED) watch, followed by several other brands that present the predecessors of

“smartwatches” during the upcoming decades, in particular the first models with GPS receiver (by GARMIN) in the early 1990s.

- 1973 The official Swiss chronometer testing institute (Controle Officiel Suisse des Chronometres – COSC) is founded setting the standards for the best quality watch mechanisms.

- 1983 SMH (Société de Microélectronique et d'Horlogerie) incorporation facilitates the merger of two Swiss associations, SSIH and ASUAG gathering in the same group approximately half of the Swiss industry resources as well as the launch of the SWATCH brand, under the guidance of Ernst Thomke and Nicolas Hayek, considered the saviors of the Swiss watch making industry. Renamed to Swatch Group in 1998, it remains the biggest Swiss watch company in the 21st century.

- 1985 Introduction of IWC Da Vinci chronograph with perpetual calendar developed by Kurt Klaus, under the guidance of Gunter Blumlein, two of the best industry executives (technical and administrative) in the 20th century. This watch model symbolizes the revival of the Swiss mechanical watchmaking during the “Quartz Crisis” period.

- 1998 SEIKO group introduces the Spring Drive watch implementing the idea of Yoshikazu Akahane, for the first real hybrid timepiece with mainspring, gear train and a Tri-Synchro quartz regulator activating an electromagnetic brake that facilitates the mechanism accurate function. Theoretically, it is the most technologically advanced timepiece ever appeared in the market.

During the 21st century, the developments refer primarily to the use of new materials for the improvement of critical mechanical caliber parts (silicon balance hairspring first introduced by Ulysse Nardin in 2001), however the real value added is rather questionable since the performance of mass production movements has proved more than adequate. Moreover, the market has developed very fast and perhaps has been saturated, with clear preference to brands that differentiate from the traditional norms, in particular to watchmakers that implement a neo-classic, modern, or even an avant-garde designing strategy. No matter the progress of the new comer smartwatches, mechanical timepieces will keep existing as long as the next generations will keep appreciating the contribution of horology in the development of human civilization. It is the buyer’s mission to be informed and distinguish between the real value and the excessive and overpriced “technology”.

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HOW THE WATCH WORKS

There are three types of watches, mechanical, quartz, “smartwatches”. It is important to clarify their basic differences regarding their most common properties.

PROPERTY	Mechanical	Quartz	Smartwatch
Accuracy	Adequate	Excellent	Absolute
Time origin	Generated	Generated	Transmitted
Life span	Unlimited	Long	Short
Repairability	Certain	Probable	Doubtful

Without ignoring exceptions and hybrid products, these three types of watches share no common technology, and actually smartwatches are not considered timepieces since they operate based on cell phone modules. Profoundly they are fully acceptable even in the watchmaking industry that most probably will fully integrate quartz and smartwatches, sooner or later. Herein, we deal only with the description of mechanical and quartz watches.

Knowing the basics is necessary for both buying and maintaining, at least a mechanical watch. Learning how the watch works should cover both Mechanical and Quartz timepieces in a parallel short presentation that includes the 3 separate basic elements of both caliber types being (a) the energy source, (b) the gear train that turns the wheels and pivots upon which the watch hands (or discs) are placed, (c) the **regulator**.

The most important of the 3 basic elements is the **regulator** that accomplishes two important functions. **(A)** In order to measure the time, the watch needs first to split the time, actually the lowest unit counted that is the second. For mechanical watches, every second “corresponds” to a fixed number of beats. This is done with the spring balance (balancier) oscillating at a frequency of 5 to 10 beats per second or in other words at a frequency of 2.5-5.0 Hz (two beats account for one oscillation thus one hertz). For quartz watches, every second “corresponds” to a fixed number of vibrations (usual frequency 32,768 Hz or cycles/sec) of the quartz crystal that is connected to an electric circuit. **(B)** In mechanical watches, the regulator “brakes” the movement of the gear train wheels controlling their turning speed. This is done by the escape wheel and pallet fork, mounted between the train wheels and the balance (oscillator). In quartz watches, timing is determined with a microprocessor connected between the quartz oscillator and the step motor that drives the wheels of the watch.

	MECHANICAL	QUARTZ
Energy source	<i>Mainspring barrel with a coil metallic spring that is wound either manually by turning the crown or automatically by the consequent motion of a rotor after moving our hand.</i>	<i>Replaceable battery or capacitor that stores chemical energy (of solar or kinetic origin) generated by a special cell or rotor respectively.</i>
Gear train	<i>A system of wheels and pivots upon which the pinions and hands of the watch are mounted to show the time. The gear train transforms the mechanical energy generated in the mainspring barrel to kinetic.</i>	<i>A system of wheels and pivots upon which the pinions and hands of the watch are mounted to show the time. The step motor along with the gear train transform the chemical energy stored in the battery or capacitor to kinetic.</i>
Regulator	<i>The spring balance oscillator (splitting the time (second) at a usual frequency of 5-8 Hz) connected with the pallet fork and the escape wheel through which the movement of the gear train wheels is controlled and regulated (“brakes”).</i>	<i>The quartz oscillator (splitting the time (second) at a usual frequency of 32,768 Hz) along with the microprocessor that transmits an electric pulse per second to the step motor driving the movement of the gear train wheels.</i>

The quartz movement thanks to the very high frequency oscillation and its much simpler construction, provides for a more accurate, practical, safe and affordable alternative in comparison to mechanical calibers. Focusing especially on accuracy, the worse theoretical anticipated deviation rating for quartz watches is +/- 15 sec/month whereas the respective acceptable average performance of mechanical watches is +/- 10 sec/day. The comparison is unfair and apocalyptic. For better understanding, the following websites with relevant demonstrations are recommended.

Mechanical watch - <https://www.youtube.com/watch/3MUL65-vZHY>

Mechanical watch (by Jacob O’Neal) - <https://animagraffs.com/mechanical-watch>

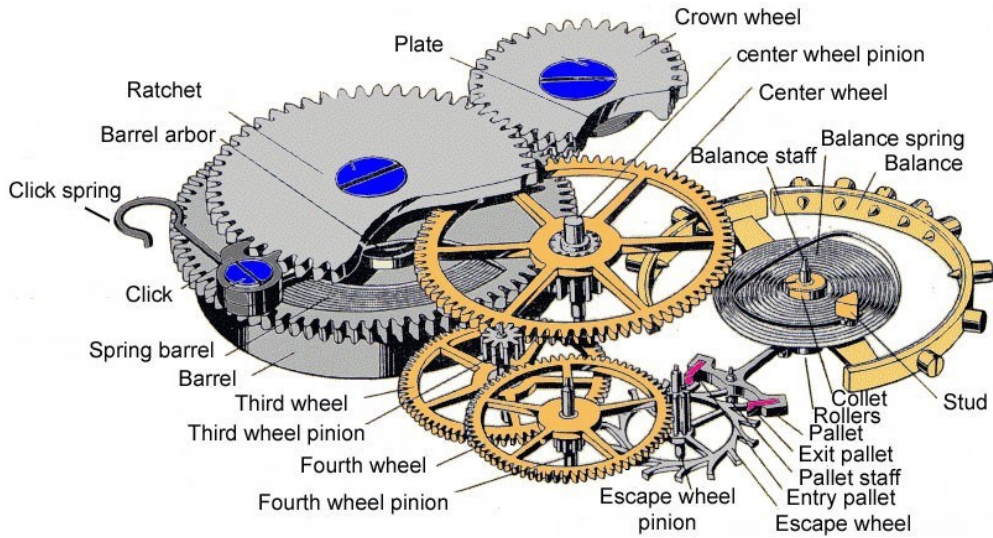
Mechanical watch - <https://precisionwatches.com/how-does-a-mechanical-watch-work>

Quartz watch (no video) - <https://www.explainthatstuff.com/quartzclockwatch.html>

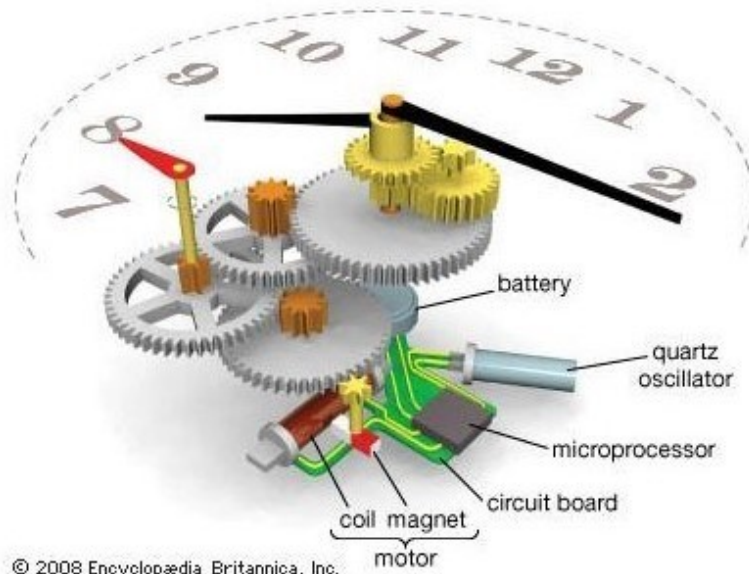
Quartz watch - https://www.youtube.com/watch?v=_2By2ane2I4&feature=youtu.be

The distinction between plain mechanical and quartz calibers concerns the vast majority of watches, however the market has presented hybrid mechanisms with the primary example being the SEIKO group Spring Drive innovative movement.

MECHANICAL CALIBER COMPONENTS (www.horlogerie-suisse.com)



QUARTZ CALIBER COMPONENTS (Encyclopedia Britannica)



THE SPACETIME OF WATCHMAKING

Examining the history of watchmaking, at least during the last 200 years, in particular since the works and days of Abraham-Louis Breguet (1747-1823) horology and watchmaking has been developed both in space and in time to the point that we need a “map” for getting through the labyrinth of the vintage and contemporary watch market. This topic provides some basic information on the periods, the industries and the brand ranges (categories) that determine the spacetime of watchmaking.

The different periods of watchmaking

A history of five (5) centuries profoundly is subjective to an extensive analysis, and there are many books and internet sources for anybody interested is searching and learning. Summarizing things, the first three centuries, meaning the 16th – 17th – 18th century concern primarily the museums. The pocket watches of the 19th century are of major interest for the collectors, but we need to focus on the development of wristwatches during the 20th century. This era is separated in six 20-year intervals.

- 1910s – 1920s is the first introductory period for wristwatches moving from the military “trench” watches of WWI to the first wrist chronographs and minute repeaters in the 1920s. Whatever significant survives today in good condition is placed in museums and safe boxes, rarely auctioned for astronomical prices.
- 1930s – 1940s is a mid-war period covering the first critical stage of development for waterproof and shock resistant wristwatches. In particular, this is the “golden period” of chronographs being the signature complication of those times, and perhaps the most important period of the 20th century for collectors.
- 1950s – 1960s is the “golden period” in general for wristwatches taking advantage of the up-rising macro-economic climate. Most of the historical brand-models and purpose-build watches (alarm, diver, GMT, etc) were introduced in these two decades, usually equipped with “in-house” manufactured mechanisms.
- 1970s – 1980s is the period that changed the horological map, once and for all. The introduction of quartz watches along with the oil crisis, deprived the mechanical watch and totally reshaped the traditional watch industries.
- 1990s – 2000s is the revival period of watchmaking entering in the internet era. Especially the first decade of the 21st century is considered the most productive historically, the one in which the most qualitative mass produced watches of all times were promoted to the new age watch enthusiasts and collectors (like the editor) in a real sense worldwide market.

- 2010s – 2020s is a period that looks more and more as a terminal one for the development of mechanical watches. The macro-economic crisis of 2008, along with the SWATCH group new strategy for ETA mechanisms, plus the coming of smartwatches, have affected quality and impose new rules in the global market.

Perhaps it is time that the traditional watchmaking industry will leave aside the “development” and focus more on the preservation of its heritage.

The different industries worldwide

Today it is rather impossible (not just difficult) to examine the national boundaries in watchmaking, especially for affordable brands. However, there are some solid characteristics that still define some origin countries in this industry.

- The EUROPEAN industry is the birth place of watchmaking experiencing a revival period, with the Germans holding the leading role though dependent to the Swiss.
- The SWISS industry is still dominant depending on its long standing tradition however today’s competition calls for strategic adjustments across the board.
- The AMERICAN industry has been very active lately regarding new coming micro-brands targeting to the local market, but the real focus is on smartwatches.
- The JAPANESE industry always depends on its strong culture producing affordable and qualitative products. The top quality watches are at last available worldwide.
- The CHINESE industry development after 2000 has opened the way for micro-brands, and delivers products of adequate (but not consistent) quality.

The different brand ranges

The separation of brands in categories is critical for any kind of market research, and helps the buyer to save time and money. There are four major brand ranges.

- The BASIC range covers the low-end segment of the market, with improved quality delivered by selected brands, but not the majority that is engaged in the marketing of cheap products. Timex - Casio - Swatch are the three standard examples.
- The MIDDLE range includes brands offering good quality watches, especially mechanical casual-dress, since the quartz models meet the competition of the basic range. Citizen - Seiko - Tissot are standard representative brands.
- The HIGH range includes brands (like Longines and Tag Heuer) delivering watches of very good quality with mass production movements covering the “rational” decision maker, but it is rather “squeezed” by the middle and luxury ranges.
- The LUXURY range includes “manufacture” brands (like Omega and Rolex) that use “in-house” movements. Two sub-categories are the Hyper-Luxury range and the independent watchmakers delivering very few and expensive watches per year.

Historically, some brands have changed range, or their product lines fall in between.



FOUR SWISS MECHANISMS

Perhaps the most significant collective contribution of the Swiss watch industry is the development of 4 lines (“families”) of mass production hand wound and automatic calibers that have equipped the majority of the modern accessible mechanical watches. These so called “workhorse” movements are **UNITAS/ETA-6497(98)** being kept in production since the early 1950s, plus **ETA-2824**, **ETA-2892**, **VALJOUX/ETA-7750** and their derivatives, produced continuously (or almost) since the 1970s. The Swatch group subsidiary ETA SA being diachronically the premier Swiss caliber manufacturer, integrated UNITAS and VALJOUX in the 1960s and the 1980s respectively, and have produced massive quantities of all the above mechanisms in 4 different grades (basic or standard - elabore - top - chronometer or COSC) and in several evolution stages (and respective editions). Moreover, in the last 30+ years, all of them have been used as base calibers for the modular integration of all available complications, from chronographs to perpetual calendars and repeaters. During the 2010s, ETA stopped supplying these calibers outside the Swatch group brands, but all of them have been available as cloned movements from alternative Swiss or Chinese manufacturers like SELLITA, LA JOUX-PERRET, SOPROD, RONDA, SEA-GULL, etc.

Basic & elabore grade

These are the entry level grades with no essential difference between the two. ETA-2824 and ETA-6497/98 are available in both grades, ETA-2892 and ETA-7750 only in Elabore grade, theoretically considered as advanced calibers. Basic grade calibers are factory regulated in a daily average deviation rate of +/-12 seconds whereas elabore grade calibers are factory regulated in a daily average deviation rate of +/-7 seconds at most, and (usually & optionally) have better plate and bridge surface finishing.

Top & chronometer grade

Despite belonging to the same lines, top grade ETA calibers are (much) better and more expensive than the entry level ones due to certain significant factory upgrades as such: (1) Glucydur alloy balance, (2) better quality hairspring, (3) better quality mainspring, (4) daily average rate deviation +/-4 seconds, with better and more stable performance regarding positional error and isochronism. All these four calibers are optionally chronometer (COSC) certified, and they are regarded as top quality mechanisms in par with the best manufacture movements available in the market, despite the general overlooking belief of being “inferior” mass production calibers.

UNITAS/ETA-6497(98) - 18,000-21,600 beats/hour - Circa 50 hours power reserve



It was introduced in 1950 being one of the last pocket calibers in the market, but has also been used in large wristwatches ever since. The versions 6497/6498-2 (6 beats/sec) are top/chronometer grade, utilized primarily inside PANERAI Luminor models (1997-2018). Selected for its reliability, It has been extensively modified and artistically treated by many independent watchmakers.

ETA-2824/2801/2804 - 28,800 beats/hour - Circa 40-45 hours power reserve



It was introduced in 1971, based on ETERNA calibers from the 1950s, and was finally refined in 1982 (version 2824-2) used ever since in most of the middle/high range automatic wristwatches. The hand wound versions 2801 and 2804 (with date) equip some of the best entry level mechanical watches in the market. BREITLING B-17 is perhaps the best top grade version ever presented.

ETA-2892/2893/2895 - 28,800 beats/hour - Circa 40 hours power reserve



It was introduced in 1975, and has excelled ever since for its tested reliability and accuracy, utilized by several luxury brands that used to assemble this caliber in their own top grade versions including ULYSSE NARDIN, IWC, FRANCK MULLER, CARTIER, and OMEGA that presented perhaps the most refined of all. Version 2893 (GMT) and 2895 (small second hand) are among the preferable ones.

VALJOUX/ETA-7750 - 28,800 beats/hour - Circa 45 hours power reserve



A legendary chronograph mechanism designed by Edmond Capt and introduced in 1973 as a reliable and low cost efficient caliber. Its production stopped two years after, and revived inside BREITLING Chronomat in 1984. Its utilization status ever since (starting with IWC Perpetual Calendar and Grande Complication models) has established this movement as one of the best ever.



HANDMADE WATCHES

Especially for mechanical watches, one of the biggest issues is how much the human factor is involved both in the manufacturing of the watch parts and the assembling of the watch itself. In general, most watches are machine made and hand finished, thus semi-handmade is the most accurate description, for watches of very good quality at least. Filenios tries to introduce herein a method for calculating the ratio of handmade work, but first come some very important clarifications.

WATCHES MADE IN ...

One thing it really bothers me when I encounter a new brand is not getting information where and how the watches are made. There are two issues here, (a) the entire process followed and how much it safeguards the quality of the delivered timepiece in the long run, (b) the validity of this "made in ..." mark most often printed in the down edge of the dial. The differences in the quality of materials and the assembling methods used in the market are significant. The most common mistake is correlating quality properties with country flags that is totally wrong. Assembling in Hong Kong or Switzerland does not make much difference today. All it counts is the responsibility of the people behind any project. Enduring the time and the cost of the necessary testing, plus rejecting the defected materials, means less profits, and unfortunately this is not acceptable by all those brands out there.

Focusing on the origin country for any timepiece, it should be easily understood that there is no official rule determining such standards. The common practice derives from the Swiss legislative example that determines three conditions allowing for the use of the "Swiss made" mark on the dial. (A) The watch should be assembled and tested in Switzerland. (B) The mechanism used should be Swiss meaning that it is assembled locally and most of its parts are also manufactured locally. (C) The national added value should be at least 60%. On the other hand, Germans sell "Made in Germany" watches equipped with Swiss movements, on the ground that (A) they assemble locally and (B) traditionally and theoretically, they build their cases and perhaps other parts locally. Usually, mechanisms and cases are often assembled in Europe, but with parts coming from Asia. This is called globalization! Eventually, what is Swiss and what is German, raises an endless discussion since the market transparency is low. This is why asking "how much handmade it is" is the most appropriate query. The answer is never expected to be straight, but at least an experienced buyer can read behind the lines and get the proper deduction.

THE MARKET PRACTISES

Theoretically, with very few exceptions, each and every part of the mechanism and the watch could be hand crafted. Profoundly this is not cost effective to the point that it gets totally insane. An independent watchmaker that designs and crafts most of the parts for his in-house mechanism, ends up with a minimum indicative price of 50,000 euro for a 3-hand timepiece. Neither he nor his customers are crazy, but they do not belong to the mainstream practices. To make the long story short, the best quality mechanisms are machine made and hand assembled, the best quality cases and hands are machine produced and hand finished, the best quality dials are semi hand crafted. Hand finishing of selected mechanism parts is an extra feature attributed to hyper luxury brands selling watches with 5-digit prices. More or less, these are set conditions that determine the market quality standards, no matter if the parts are produced in-house, or are outsourced from third party suppliers. Given the increasing demand for movements in the last decade, as well as the specifications of the new calibers developed in the industry, it gets more and more apparent that even the assembling of the “new generation” top grade mechanisms has become more automated, and would not be a surprise if the top luxury brands, have already restricted their handmade process only to the final watch assembling. This is the last frontier, probably only for mechanical watches, though even this is questionable for the leading middle range brands like Citizen, Seiko and those belonging in the Swatch group.

HANDMADE WORK RATIO (%) FOR MECHANICAL WATCHES

It should be calculated on the net retail price of the watch that includes both the total labor cost and the cost of parts. The first should be allocated 80% to the final ratio, with 20% operating cost deductions. For instance, if the labor cost is 30% of the retail price, even if all the parts are totally machine made, the watch is 24% handmade. The parts should be examined separately according to the following assumptions.

Mechanism: Standard/Elabore grade allocation 20-30%. Top grade allocation 40-50%. Independent brands (in-house) 60-80%. New generation calibers 0% per case.

Case & Bracelet: Hand finished 50% allocation - Machine finished 0% allocation.

Dial & Hands: Handmade up to 80% allocation - Ready made 0-20% allocation.

Leather strap: Handmade up to 80% allocation - Ready made 0-20% allocation.

According to the above, a watch assembled with a labor cost of 300 euro, with a top grade mechanism of 500 euro, with a hand finished case of 250 euro, with ready made dial and hands of 50 euro, with fully handmade leather strap of 150 euro, is 59% handmade on an indicative net retail price of 1.250 euro. This is an optimum example for one self-employed watchmaker who works with top quality outsourced parts.

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EVALUATING or RATING WATCHES

Many people in the market have developed methods for evaluating watches on various criteria. Focusing on the tangible features, that means the mechanism, the case, the bracelet/strap, the dial and the hands, I present below a rating method that applies to any mechanical watch, with a dual scope. First, it quantifies (highest score 20) the quality level of the rated watch. Second, it serves as a guide for the selection of the appropriate parts, for watch assembling projects.

Mechanism Rates

1	Chinese & Ex-Soviet mass production and usually undefined
2	Swatch, Chinese basic: Dixmont Guangzhou DG28/38, Sea-Gull ST16/17, etc
3	Miyota 82XX, Orient 469 Based, Seiko 7S/4R, Chinese serviced/upgraded (B-18), etc
4	ETA Sis51/2824(Basic/Elabore), Swiss clones (SW), Miyota 9015, Orient star, Seiko 6R, etc
5	ETA2892/6497/7750 (+Derivatives) Elabore grade, Selective brand calibers, etc
6	ETA + Swatch Group Top Grade (COSC), Grand Seiko, Richmont Group, Rolex, VMF, etc
7	Daily deviation up to 2 seconds: Tourbillon certified, Seiko Spring Drive, etc

Case Rates

1	Plastic, Low grade alloy - Acrylic/Mineral crystal, etc
2	Stainless Steel, Titanium - Acrylic/Mineral crystal, etc
3	Premium Bronze, Gold14/18k, Stainless Steel, Titanium - Sapphire crystal, etc
4	Premium carbon, Steel hardened, Platinum - Sapphire crystal, etc

Bracelet/strap Rates

1	Average Quality
2	Good Quality - Solid Bracelet
3	Very Good / Top Quality - Hand Finished - Handmade - Micro Adjustment

Dial Rates

1	Average / Good Quality (Luminosity included)
2	Very Good Quality (Luminosity included)
3	Top Quality (Luminosity included)

Hand Rates

1	Painted Hands (Luminosity included)
2	Electroplated Hands (Luminosity included)
3	Top Quality / Handmade Hands (Luminosity included)

According to the resulting sum, plus one unit for any unique feature (for instance, shell cordovan leather strap, handmade guilloche or enamel dial), as well as +/- one unit for functionality issues (crown/pushers handling), watches fall in the following categories: 19-20/20 Excellent, 16-18/20 Very Good, 13-15/20 Good, 10-12/20 Good Enough, 8-9/20 Average - Basic, below which the quality level is not adequate and acceptable.

EXAMPLES

WATCHES MODELS	SWATCH SISTEM 51	TISSOT PR-100	SINN 856 UTC	ROLEX DATEJUST
Mechanism	4	4	5	6
Case	1	3	4	3
Bracelet/Strap	2	2	2	3
Dial	2	2	2	3
Hands	2	2	2	3
Unique Feature	0	0	1	0
Score	11/20	13/20	16/20	18/20
Quality Level	Good Enough	Good	Very Good	Very Good

WATCHES MODELS	TIMEX AUTOMATIC	SEIKO PRESAGE 6R	NOMOS CLUB ALPHA	GRAND SEIKO SPRING DRIVE
Mechanism	3	4	6	7
Case	2	3	3	3
Bracelet/Strap	2	2	3	3
Dial	2	2	2	3
Hands	2	2	2	3
Unique Feature	0	0	1	0
Score	11/20	13/20	17/20	19/20
Quality Level	Good Enough	Good	Very Good	Excellent

Considering that the absolute reference point (20/20) is rather theoretical, the overall scaling is strict, but also representative of the real quality differences among the six brand ranges, basic (Casio, Swatch, Timex, etc), middle (Citizen, Seiko, Tissot, etc), high (Longines, Nomos, Tag Heuer, etc), Luxury (Cartier, Omega, Rolex, etc), Hyper luxury (AP, PP, VC, etc), Independent watchmakers. The huge price differences are justified on three assumptions. (1) Rolex reputation costs more than Nomos or Seiko. (2) Production Investments (manufactures) require much higher prices to be amortized. (3) The labor (intellectual) cost of high-end watchmaking is multiple times higher than the cost of materials and parts, especially when we are examining handmade timepieces coming from independent watchmakers. The higher the gap between quality and price difference, the higher the need to deduct the real value in today's watchmaking.



BUYING & COLLECTING WATCHES

A watch keeps its value thanks to its character. Picking up just a nice design without character is a usual mistake in a market full of temptations. There are four characters, alternative or co-existing, that define a watch. Historical, Symbolic, Artistic, technological. Such a characteristic is an add-on value that affects positively the market price, and per case designates the collection type. Further on, there are three (3) generic tips for buying watches, especially those regarded as collectible items.

- (A) **DO NOT SPLIT YOUR BUDGET.** Setting a budget is the first “obligatory” step. A usual mistake for watch enthusiasts is allocating their budget to more than 2 watches per year. If you find a watch of 10,000 euro affordable, go for it without compromising with lower price alternatives. Even if you collect, you do not need more than 10-20 items for a complete line (max 30), and you are not obliged to buy them within a year.
- (B) **SET YOUR CLEAR CRITERIA.** (1) You need to select a proper case size. A big watch on a small wrist will probably make you tired in the long run. (2) You need to distinguish between casual dress and casual sport options, not ending up with a diver model used in frequent formal dress occasions. Preferably and for practical reasons, a casual-sport watch could be quartz, and a casual-dress watch could be mechanical. (3) You need to check if your target watch could be serviced in your area. If the local brand facilities are not adequate or non-existent, the watch should be serviced by an independent technician and this is not always feasible. For very expensive watches (particularly from independent watchmakers) you should deliver to their facilities for service. (4) You need to select the right type of watch, according to your real needs and wishes, indicatively among 25 major categories listed in the next pages.
- (C) **BUILT A COHERENT COLLECTION.** The usual mistake for most enthusiast and collectors (including myself...) is the fact that we buy many different types of watches, without a clear target. This does not affect only our pocket money, but also the overall value of our collection. The two “easy” decisions are collecting watches with specific country of origin, or collecting watches of the same brand. If you ignore these two major criteria, you need to select the proper type of watch considering the following comprehensive list. The tip is collecting the same type building a valuable portfolio of 10-20 timepieces safeguarding your overall investment in the long run, for potentially trading the entire collection.

These 25 types or categories of watches listed alphabetically herein concern both the collectors and the occasional buyers looking for a gift timepiece.

- **ALARM** watches mechanical or quartz are addressed to all budgets, with many vintage or contemporary alternatives.
- **ANNUAL CALENDAR** watches are strictly mechanical and appeared recently in 1996 as an alternative to potentially problematic **Perpetual Calendar** models. Limited availability of models addressed to high limit budgets. If affordable, it is a smart choice of a watch used all year long excluding all the rest in the safe box!
- **ANONYMOUS** watches bear their own symbolic character and are addressed to those who want to build their own watch with off the shelf parts.
- **ARTISTIC** hand painted or engraved watches are naturally addressed to those who appreciate their respective artistic value, and can set a relatively high limit budget, at least for the models coming from the luxury brands.
- **ASTRONOMIC** watches, apart from those indicating just the moon phase, belong to a very particular segment of complicated timepieces with limited availability, addressed to high limit budgets.
- **AUTOMOTIVE STYLE** watches are based on vintage car dashboard clocks (I call them EXBO) and profoundly are addressed to people affiliated with the car industry and its history, with a modest availability of good watch examples.
- **CARTOON** watches exist over a century deriving primarily from the engagement of various established brands in projects with Disney, without excluding other sources. Very good quality examples of watches however are rare/expensive.
- **DIGITAL** watches refer both to quartz electronic ones and to mechanical jumping hour (or even minute), with the last ones bearing high prices. A particular category with modest availability of vintage and contemporary models, ideal for a special collection.
- **DIVING** watches belong to the most abundant category regarding models addressed to all budgets. One very particular segment is that of homages including qualitative and affordable watches with strong historical character.
- **EXTRAVAGANT** watches are usually expensive coming primarily from independent watchmakers, equipped per case with modified mass production calibers. It is one of the most significant categories for collectors.
- **GMT/WORLDTIME** watches are naturally addressed to travelers or professionals contacting facilities in different time zones, with many classic models presented in the industry over the last 70 years.
- **MARINE STYLE** watches are among the most desired casual dress timepieces around, for informed buyers. Primarily mechanical, they are addressed to middle-high limit budgets, with a large availability of models.
- **MECHANICAL CHRONOGRAPHS** primarily hand wound models and in particular vintage ones are among the highest return investing timepieces for serious collectors. Despite their availability, they demand high limit budgets.
- **MECHANICAL POWER RESERVE** preferably hand wound watches, they are addressed to connoisseurs who appreciate the essence of horology and those watchmakers that keep the tradition alive. Large availability of models requiring relatively high limit budgets.

- **MILITARY STYLE** watches are usually affordable and appreciated for their simplicity and legibility, besides their strong historical character. Vintage ones properly overhauled are addressed to high limit budgets, with great demand among collectors.
- **NOP** (New Old Project) watches refer to “marriage” timepieces with vintage orphaned calibers fit in new cases, and they usually demand high prices due to their rarity.
- **PILOT STYLE** chronographs or three hand watches refer not only to heritage and homage models, but also to those based on historical plane dashboard clocks (EXBO – Ex Board). Plethora of models, available for all budget levels.
- **POCKET** watches are the favorite category for the connoisseurs and market professionals who know that well maintained rare pocket watches are investment items. There are several sub-categories, thus this is naturally the most broad type of timepieces, among the twenty-five listed herein.
- **QUARTZ HIGH PRECISION** watches are priced up to 20,000 euro approximately, with more than 10 models deriving from high and luxury range brands. Despite the general market disregard for these watches, they are considered collectible and less overpriced than mechanical timepieces of the same price range.
- **RACING CHRONOGRAPHS** vintage, heritage or homage models, mechanical or quartz, are coming from the 1960s and 1970s and are highly regarded especially among the car racing fans, addressed to all budgets.
- **RAILROAD STYLE** watches are the most affordable among all the historical categories, with limited availability of contemporary wrist watches covering at least all budget levels.
- **REPEATER** watches are the most complicated of all, and naturally they are addressed in a very limited market segment due to their extremely high prices.
- **SINGLE HAND** watches, strictly mechanical, have a strong symbolic character addressed to people pursuing a relaxed attitude relying on their mobile cellphone for precise timing. Limited availability of models for middle-high limit budgets.
- **SKELETONIZED** mechanical watches cover all budgets with the artistically treated ones being ideal collectible items, with most of them based on the workhorse hand wound Cal.Unitas/ETA-6497/98.
- **TOURBILLON** watches have become more affordable thanks to the relatively recent development of the Chinese mechanisms, however they remain a questionable topic since most of them are decorative.

Considering the two major types of calibers, those who run after absolute accuracy over any mechanical watch are in the wrong path ignoring the very fact that the quartz technology provides for more accurate, more sustainable, more affordable, better overall watches. The international market has developed so extensively, with such a high availability of brand new or used watches, for the satisfaction of any need no matter the budget limit. Only prerequisite the informed and conscious buyer!

THE SIZE DOES MATTER

The relatively recent trend for very large watches (attributed primarily to Audemars Piguet and Panerai in the 1990s) is a rather fashion thing, and any conscious buyer should match the watch size to his wrist. Moreover, bracelets and straps (especially after market) are available in various sizes and qualities affecting significantly the look and wearability of watches. Some basic tips: (1) Small cases get “larger” with metal bracelets. (2) A second smart approach to small cases is the use of leather straps with pads. (3) Large cases will lose their appeal over time, both in our mind and the other’s eyes. (4) Rectangular cases are bigger than round ones. (5) Handmade leather straps are more durable than expensive. The table below is an indicative guide for selecting watch cases and bracelets or straps.

WRISTWATCHES <u>ROUND</u> CASE & STRAP SIZE						
CASE SIZE men in mm	34-36	37-39	40-42	43-45	46-48	STRAP SIZE
	S	M	L	XL	XXL	In mm (+/-10)
WRIST SIZE						
S 15-16cm/6in	X	X				170 (100+70)
M 17-18cm/7in	X	X	X			185 (110+75)
L 19-20cm/7.5-8.0in	X	X	X	X		200 (120+80)
XL 21-22cm/8.5-9.0in		X	X	X	X	215 (130+85)
CASE SIZE women in mm	22-24	25-27	28-30	31-33	34-36	
	XS	S	M	L	XL	

COLLECTORS' STATUS

Collectors fall in 4 categories: Primary class collecting watches up to 1,000 euro. Middle class collecting watches from 1,000 to 10,000 euro. High class collecting watches from 10,000 to 100,000 euro. Top class collecting watches above 100,000 euro. This distinction based on the number of price digits helps the collector to focus, and not waste time and money. There are three basic criteria for selecting category. The first profound one is the financial status. The second one is the perception of the watch as an investment item. A top class collector who does not invest in watches, he just loses money (still his privilege...). The third one is the residence country. Buying watches of 10,000+ euro in a country without adequate service facilities, potentially is meaningless, unless someone is prepared to travel abroad and deliver his watch to an eligible address, most probably to the brand itself. Any collector, no matter his status, should be proud of his portfolio, and this is the biggest challenge of all!



USING WATCHES - WATER RESISTANCE

The theoretical water resistance rating of watches does not correspond to the real condition of usage. In simple words, a watch with 30m mark on the dial is not suitable for diving up to 30m, not even for swimming. Any watch could leak from any opening, with potential issues related to the sealing of (a) the crown, (b) the pushers, (c) the front or the back glass, (d) the back screw-in or push-in cover. The following tips are useful for those that wear their watch in water: (1) No watch should be worn during shower due to the risk of moisture effect inside the case. (2) The minimum water resistance rating for watches subjected to swimming and water sports is 100m. (3) Non-diving chronographs, even if they are adequately water resistant, are not suitable for swimming, especially in the sea. (4) Any watch that is used in water, should be tested for its water resistance (up to 10ATM) regularly every 2, maximum 3 years, and if used for diving, should be tested every year. (5) Any quartz watch that is used in water, should be tested for its water resistance after each and every battery replacement due to potential gasket misplacement and consequent leakage (most frequent damage incidents). (6) Especially the back cover gasket should be treated regularly with special grease for maintenance. (7) The crown position should be checked before each and every water contact. (8) If moisture or water is evident inside the watch, it should be opened and get dry immediately, for avoiding the rust effect.

INDICATIVE TABLE OF WATER RESISTANCE CONDITIONS

Water Resistance Water Condition	0/10m	30/50m	100m	200m
Showering	X	X	X	X
Splashing	✓	✓	✓	✓
Raining	X	✓	✓	✓
Swimming	X	X	✓	✓
Diving	X	X	X	✓



USING QUARTZ WATCHES - BATTERY REPLACEMENT

Most quartz watches use regularly replaceable round button (coin) cell batteries or solar/kinetic capacitors. The first need frequent battery replacement (usually every 2-3 years), and some of them allow the user to do it himself or herself, so the following tips might prove useful. (1) The most common brands producing quartz calibers with replaceable battery are CASIO, CITIZEN/MIYOTA, EPSON/SII(SEIKO), ETA(SWATCH), RONDA, SUUNTO, TIMEX. (2) The preferable cell battery producers are ENERGIZER, MAXELL, MURATA, PANASONIC, RENATA(SWATCH), SEIZAIKEN(SEIKO), but most important is the selection of credible sellers, plus checking the package expiration date in advance. (3) The preferable common battery type is 1.55V silver oxide (not alkaline or mercury oxide) being eco-friendly, with the exception of the calibers that use 3V lithium batteries (up to 10 years duration). (4) Apart from Renata*, most producers use a standard naming syntax including the letters SR (Silver oxide Round) and CR (Lithium Round) along with numbers designating in mm the cell diameter (first number) and thickness (last two numbers). (5) The replaceable battery should be handled with a plastic tool (not metallic or naked fingers) for avoiding potential discharging and consequent autonomy reduction, plus the caliber should be touched with latex covers for avoiding potential moisture effect. (6) If the watch stops, the old battery should be removed or replaced ASAP, for avoiding potential leakage.

CROSS REFERENCE TABLE MATCHING BATTERIES WITH CALIBERS

STANDARD IEC / JIS	RENATA REF	30 PLUS INDICATIVE CALIBERS/MODELS
SR626	376/377	MIYOTA-2035 - EPSON-Y121 - SII-PC2X - ETA-804/05 - SWATCH
SR916	373	ETA-255/ETA-E64 (HIGH QUALITY MOVEMENTS)
SR920	370/371	EPSON-VL57/58 - SII-VD5X - ETA-F05/06/07 - RONDA-5XX/7XX
SR927	395/399	MIYOTA-0S/6S10/20+ - ETA-955 - ETA-988 - RONDA-Z50/60
SR936	394	SII-VK6X - ETA-251 - ETA-G10 - SWATCH CHRONO
SR1130	389/390	SWATCH ORIGINAL LARGE/GENT
CR1220	CR1220	DIGITAL - CASIO G-SHOCK VINTAGE
CR1632	CR1632	ETA-E40 (TISSOT T-TOUCH) - SWATCH (BEAT/SYNCHRO)
CR2016	CR2016	CASIO G-SHOCK (DW5000/5600/6900) - RONDA-715Li - TIMEX
CR2025	CR2025	CASIO G-SHOCK (DW5500/G-9000) - SWATCH (FUN SCUBA/TOUCH)
CR2032	CR2032	SUUNTO (OBSERVER/ELEMENTUM)
CR2430	CR2430	SUUNTO (VECTOR/X-LANDER)

*Renata reference numbers are used by others as well



MAINTAINING & SERVICING WATCHES

Buying a watch without considering its potential servicing and maintenance, or even repairing implications, is a wrong attitude. First comes first, servicing is a local issue, especially for countries that are far away from the developed horological centers. Even more, in many countries, little care is taken for the training of new watchmakers, and the big issue is how feasible will be the servicing of watches in such places, in 10-20-30 years from now. This is why the most capable independent watchmaking technicians build websites and create an international profile providing their services to any market that lacks the proper resources. Their development is crucial despite the fact that many established brands try to isolate them, with a clear strategy of restraining the service of their watches in their own facilities. On the long run, this is a deadlock situation, not only for their customers, but also for themselves...

HOW OFTEN SHOULD WE HAVE OUR WATCH SERVICED?

It depends on three factors. First, the type of caliber, **mechanical watches require regular servicing**, on the other hand, **quartz watches although they might operate constantly are less susceptible to wear and tear issues**, thus they are serviced when they stop working properly. It is noted that top grade quartz watches (Grand Seiko) have a very long anticipated life span (up to 50 years) on the ground that their caliber is sealed to the point that its lubricants are not affected, for any reason. A very crucial issue however is that the battery or capacitor replacement in quartz watches is subjected to potential problems, if it is not done properly by professionals. Second, **vintage and manufacture mechanisms require proactive servicing**, for avoiding the replacing of parts that might not be easily available, on the contrary to mass production contemporary movements. Third and for most, **the frequency of servicing depends on the frequency of use**. Everyday constant use requires indicatively service every five (5) years, regular use of one or two months per year requires service every ten (10) years, rare use for one or two weeks per year require service every fifteen (15) years at most. In all cases, mechanical watches should be wound every two months for maintaining their lubrication in the minimum adequate condition.

DESCRIPTION OF PROPER SERVICE

Every technician should be properly organized and equipped keeping a written process, and issuing a service (or even an identity) certificate, especially for collectible watches. Proper servicing of mechanical watches includes the following steps:

1. Checking the watch macroscopically and on the oscilloscope (timegrapher), for identifying the described problem, plus its overall condition and the necessity of service.
2. Disassembling the watch, in particular the mechanism, allocating the parts in special baskets, plus checking all the critical elements for potential defects that require treatment or replacement.
3. Cleaning the mechanism parts in ultrasonic machines and if necessary by hand with appropriate liquids (petrol) wherever applicable.
4. Refinishing the rest watch parts. The Dial and hands are repaired by specialized technicians (if necessary), on the contrary to the case and bracelet that can be polished or brushed, with commonly used equipment, without high expertise requirement. Detailed case treatment requires crystal extraction and repositioning, for avoiding potential damage to its sealing.
5. Checking, maintaining or even replacing all the sealing rubber gaskets of the crystal, the crown, the pushers (chronographs) and the case back. Especially for sport watches, this step is crucial requiring the use of qualitative aftermarket replacing parts, wherever necessary and possible.
6. Reassembling the mechanism and the watch securing (a) proper caliber lubrication with special synthetic oils (one of the most critical and demanding works), (b) proper hands alignment, (c) proper operation of all functions, (d) proper gaskets application (usual defect for water inflow), (e) proper crown and pushers' function.
7. Checking and regulating the watch on the timegrapher, for the following parameters: (1) Accuracy rate that must be set within +10 seconds per day, at least for Swiss basic grade calibers. (2) Amplitude showing the balance rotation degrees that must be around 280 (+/-10%), primarily securing that the mainspring provides adequate power to the movement. (3) Beat error that must be set around 0.0 (+/-0.3) milliseconds indicating that the balance swings equally in both directions, and it is well adjusted.
8. Waterproof testing according to the watch water resistance rating. All watches should be tested at pressure 3 bars at least. Diver ones should be tested at pressure 10 bars at least (every 2 years). After the test, the technician must tighten the case back, one last time.
9. Testing the watch (automatics on the winder), at least for two-three days, before delivery.

The above described nine steps indicate that servicing a mechanical watch is not a simple task, and any undertaking watchmaker should be qualified and well equipped. Profoundly, the more complicated the watch, the more time consuming and costly the service should be. In practice, such a detailed process is rarely observed 100%, but any mechanical watch owner should be adequately informed dealing with his technician.

LESS IS MORE

The long-term projection is that proper servicing – maintenance – repairing will get more difficult and expensive due to diminishing supply of facilities and increasing demand from watch owners and collectors. This is why 2/3-hand watches with the least possible functions are the preferable ones, especially for less developed markets.

George Serafimides