


The Calibre B01 represents the crowning achievement of the company's 125th anniversary, ushering in a new era for its chronograph movements and validating it as a true *manufacture*.

The Calibre 1887 - TAG Heuer's first movement built in-house, based on the design of the Seiko 6S37 chronograph movement.

All in the Movement

 The growing pressure to produce movements in-house affects even relative giants such as TAG Heuer and Breitling. Both companies consume ETA/Valjoux movements in six figure volumes on an annual basis and are hyper-sensitive to changes in costs, conditions and supply. No-one, therefore, is more keenly aware of the Swatch Group's intentions regarding the future supply of movements and *ébauches* - the late Nicholas Hayek's public utterances on this leave little room for doubt.

Ken Kessler and Peter Roberts FBHI

TAG Heuer and Breitling have responded to the Swatch Group's impending withdrawal of supplies with the development of new in-house calibres - both automatic chronograph movements as befit two brands known for such timepieces. The two companies have, however, chosen different paths that reveal much about their future ambitions and strategies. *QP* arranged for Master Watchmaker Peter Roberts FBHI - the first Englishman

to graduate from the Swiss watchmaking school, WOSTEP, ex- lecturer at Hackney Technical College where former students included Peter Speake-Marin and Stephen Forsey and currently the technical director of Bremont - to analyse the two. With decades of experience at Rolex and other brands behind him, Roberts is one of the pre-eminent authorities on movement design.

TAG HEUER CALIBRE 1887

TAG Heuer's Calibre 1887 - the movement is named for the year in which Edouard Heuer invented the oscillating pinion system - was born into a morass of web-sourced controversy. The company's initial announcement suggested that the design was created completely in-house, sparking immediate negative reactions from aficionados who quickly spotted the resemblance to Seiko's classic TC78. Instead of developing the movement from a clean sheet, TAG Heuer acquired the IP rights to the TC78. As Roberts learned from a meeting with TAG engineers, the Swiss house has made interesting changes to the movement since starting work on it in 2007.

"Seiko employed this movement in a rather interesting chronograph. It's a column-wheel design, with oscillating pinion, which, coincidentally, was invented by Heuer in 1887. It's a nice chronograph made in very much the Japanese way. If you look at the automatic winding system, it's classic Seiko: twin-arm, twin-click cam drive. Any watchmaker [or aficionado] would look at this movement and immediately recognise it as a Seiko, even if it had no other markings on it.

"Obviously, it uses a Japanese balance/spring, shock absorber - a nice piece, and as usual, as far as Japanese watches are concerned, it's function before form, absolutely. So it's a good-looking piece, but no thrills, no added embellishment. It is typically Japanese, beautifully-engineered, but you don't get that historical touch that the Swiss would give to a watch."

As Roberts analysed the Calibre 1887, he felt that he was looking at a complete rebuild, with wholesale design changes. "TAG Heuer didn't just buy it and change the name plate, as, say, British Leyland did with the MG 1100. It is totally their remaking of the movement. As Stephane Linder, TAG Heuer's technical

director, told us, 'There is only one piece in the entire watch that is not re-manufactured.' He wouldn't tell us what it was, but apparently it's very small!"

What you might call the interface between the base movement and the chronograph works. Effective, if not elegant in engineering terms, the oscillating pinion connects sets of gears by moving the pinion horizontally into contact. Though as Roberts pointed out: "The latest fad, and we'll come to that on the Breitling, is what they call the vertical clutch, which works more like the clutch in a car, allowing you to engage and disengage the chronograph. A third, 'classic' system is to use spur gears, which can be engaged or disengaged using a coupling device.

Reverse engineering

"If you want to compare them, you could say the TAG Heuer system is very good, very effective, and to give it its full credit, it has been used in more chronographs than probably all of the other methods put together - including its use in the 7750. And it is a 'Heuer thing', so it's interesting for them that Seiko just happened to use it quite independently. It's a nice coincidence that brings it full circle."

Roberts acknowledges that TAG Heuer had to do a lot of reverse engineering. "The designers had to disassemble the movement and start from scratch on how to make each part. This is not as easy as people may think. They see what the Chinese are doing, who seem to be able to copy things almost instantaneously. But it's not so easy to reverse engineer something properly and with engineering integrity, which is the way TAG Heuer has done things.

"This is a tricky job, but it's still much, much cheaper than designing an entirely new movement from scratch. And

The 1887's column wheel.



The 1887's oscillating pinion.





The Calibre 1887 is an integrated chronograph movement with 320 parts in total. Of that, about 270 are made in Switzerland, some by TAG Heuer/Cortech (bridges, plates, oscillating weight) and some by specialist suppliers such as Nivarox. Many of these parts have been upgraded from the original design.



An original drawing from 1886 featuring Heuer's column-wheel design, with oscillating pinion.

the Seiko movement was not just designed for price; it was designed to be built by state-of-the-art, automatic machines using the latest manufacturing techniques."

The nine main movement parts, the platine or main plate and all the bridges are made at the Cornol factory in the Swiss Jura. Completely re-equipped with the very latest machinery, this is now one of the most advanced facilities in Switzerland. Main assembly takes place at factories in La Chaux-de-Fonds, also known as T1 Assembly, again using state-of-the-art equipment. Wheels, jewels, and other smaller components are basically out-sourced, as is normal practice throughout the watch industry. Roberts points out that although TAG could have made everything in-house, this would have tripled the price of the watch in which the movement is placed.

"One of the main criteria, as far as I can see, was to get an in-house movement into watches at the same price as a Valjoux 7750 series. And TAG Heuer has pretty much done that, which is quite something. Once upon a time, 7750s were quite cheap to obtain, but now they're relatively expensive so it becomes cost-effective to make movements this way, whereas Breitling has used a different route.

"TAG Heuer has changed elements in the process of reverse engineering, but has maintained the classic Seiko wind system, which has been proven in millions of watches over the years. It's pretty fail-safe, so why change it? But they have changed certain things in there - the oscillating pinion, of course, as well as much of the mechanism in the chronograph.

Making it Swiss

"There is now a Swiss Clinergic escapement in there, fast-beat, 28,800,

and, of course, the balance assembly is now Swiss with a Nivarox spring, Glucydur balance. Seiko used its own balance, its own springs, its own shock absorber. All these components are now Swiss, while everything including every gear and wheel has been re-engineered and remade.

"The platine is also totally different: certain things are in the same place, but everything else about it is different. All of the bridges are different, the rotor, of course, is considerably modified, with its own special shape and design, and it has a different bearing. There are more jewels in the movement: 39 as opposed to 35 in the Seiko. They have also changed the motion work and the dimensions of the movement."

Interestingly, after TAG Heuer's reworking, the movement is slightly slimmer at 7.13mm; the Seiko is 7.27mm. Conversely, the diameter of the TAG Heuer is slightly greater, reflecting the bigger watches of today, but not by much: 29.3mm against 28.4mm. "So it's a nicely-sized movement, although not classically slim for an automatic chronograph. The El Primero, for example, is 6.5mm thick. But nevertheless, it's still a good size and it's not overly large, so it can be put into larger or smaller watchcases.

"TAG-Heuer uses 22 out-sourced Swiss suppliers for making various parts, and, as I said, just one part that's from Seiko, the 'mystery' part. But above all, the movement is finished to a proper Swiss standard: Cotes de Geneve, perlage, nice edge finishing with diamond polishing, blued column wheel, nice quality screws - again, all Swiss-made and engineered to Swiss specification - a very different finish to that used on the original. And above all, the watch performs well."

Roberts doesn't hesitate when he says that, "TAG Heuer earned the right to call this an in-house movement. If they bought Seiko's movement and just changed the balance, maybe the escapement, and fitted a new rotor, you couldn't say it

was *manufacture*. But I think it's safe to say that this is a TAG Heuer *manufacture* movement. The reasons? The company has redesigned it completely and makes every significant part of it. What it doesn't make - the jewels, the balance, the mainspring, etc - most manufacturers don't make these, either."

Branching out

Because of the scale of TAG Heuer's operation, it's likely that the company will need every movement it can make. It would be a delicious irony if TAG Heuer could produce enough to supply other brands that weren't able to produce their own calibres in the wake of Swatch's decision to scale back OEM production. With the present factories, TAG Heuer has output capacity for 50,000 movements per year, starting with 25,000 per year, with the plan to increase it by 10,000 per year. At the moment, they're only putting this movement into one range of watches. After that there are likely to be modifications to it and then the movement will be used in other models.

As Roberts says: "To produce this is very expensive, but if you can make 50,000,

the costs will come down. And if you make another 200,000, the costs come down further, so year on year it becomes cost-effective against the increasing costs of acquiring Valjoux movements. This is the main reason why so many companies are introducing in-house movements. I don't think that TAG Heuer or Breitling for that matter would have been quite so spurred on into doing this if they were without the worries of supply issues from the Swatch Group."

As far as one can see from the figures, TAG has achieved its goal at a quarter of the cost of starting from scratch. "It's hard to give an exact figure as to what it would cost to develop a movement like this from a plain sheet of paper, instead of re-developing the Seiko. But thinking in terms of percentages rather than exact development costs, TAG Heuer has got it within the price of the Valjoux."

The proof is the price of the launch watch, the Carrera Calibre 1887: it sells for an astonishingly affordable £2,350.



Available with white or black dial both with either a leather strap or bracelet, the TAG Heuer Carrera Calibre 1887 is the first piece to feature the new movement.

BREITLING CALIBRE B01

Everything changes when you turn to the Breitling, the most vivid and telling element being the price of the watch in which the B01 makes its debut. Depending on which version of the Chronomat selected, the price is roughly double that of the Carrera Calibre 1887. But this approach liberates Breitling from the price constraints applied to the TAG Heuer, enabling them to create an entirely new calibre.

Breitling generously sent Roberts a movement to examine. "This is truly Breitling's first *manufacture* movement and the company has gone a different route from TAG Heuer. The designers

probably began development with this one a little bit earlier: from the numbers I have, 2004 is when they first started working on it. And as you know, in 2004 things were still going pretty well as regards the world's financial climate and in the watchmaking world." Breitling completed the design around 2007, enabling production to commence in 2008 and a public launch in 2009.

The race to be first

"If you go back to 1969, Breitling, with our friends at Heuer and Hamilton/Buren, produced the Calibre 11, which was one of the first self-winding chronographs - a close call with the Zenith El Primero and,

The B01 features an optimised column-wheel device that provides precise control of chronograph functions.





coincidentally, Seiko's first automatic chronograph. Breitling was closely involved in the overall design, although the main work for the chronograph module was by Dubois-Depraz.

"If you look at the Calibre 11, it's a different type of design from the B01. Here you have a movement fitted with an integrated self-winding work, utilising a micro-rotor, resulting in a very slim design upon which is mounted a chronograph module that can be removed in one piece - 3 screws. Unfortunately we now have quite a thick movement.

"The other way to make a self-winding chronograph is to integrate all of the mechanisms into the movement; this was done on the El Primero and is what Breitling has done with the B01. A disadvantage, however, for the watchmaker is that when you integrate them, you have all of these complexities on top of and mixed up with each other, so if something goes wrong somewhere, you often have a lot of disassembly. Breitling has gone a long way with its new design to address this.

"With the new B01, Breitling has integrated everything together, which tends to make a slimmer watch. Not afraid to use old technology, the company uses a column wheel, which is still considered by watch lovers as the nicest device to use as the operating system inside your chronograph.

"There's something about a column wheel that we all love as watchmakers. They are also much easier to make nowadays with modern precision engineering.

But Breitling has

done it in a very up-to-date way because the designers have used a vertical clutch for the connection between the timepiece and the chronograph, instead of an oscillating pinion or normal coupling clutch spur gears."

Oscilating pinion V vertical clutch

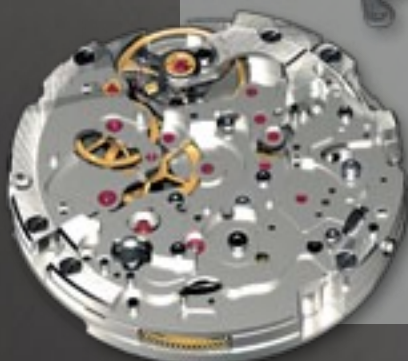
Thus one of the primary differences between the TAG Heuer and the Breitling is the oscillating pinion versus the vertical clutch system. "The vertical clutch system, which is very fashionable at the moment, is a nice system. Although not a new idea it works very well with modern materials and technologies.

"When you engage the drive on the B01, it runs the chronograph seconds hand, the minute recorder and the hour recorder, all from the same drive. This is a nice idea because it means that they must always be in synchronisation with each other. With a lot of other chronographs, the hour recorder, in particular, is driven separately. It's not a great disadvantage, but this method is a bit of a plus."

Breitling also fitted the B01 with self-centring reset hammers. "These are the fly-back hammers of the chronograph, which, for manufacturing/assembly and for later servicing, are also a big plus. Again, this is the latest design trend as used by Rolex and others. In the old days, when operating the return-to-zero, the watchmaker often had to adjust these hammers by filing and polishing - a skilled and time-consuming operation. Nowadays, the hammers have a flexible, self-centring system built into them so they find their own natural positions when they are reset. This makes manufacturing and repair so much quicker.

"These systems are very dependable. One must remember that modern watches are made on machines, with hand-assembly used only when strictly necessary. Therefore, these systems, although nice

The B01 project has created a specialised assembly process that involves an ultra sophisticated computer programme that monitors and routes each movement throughout the various paths of assembly.



for the watchmaker, are there as much to help with assembly in large numbers and to keep the costs down."

Breitling has made a major point of having a fine-index adjustment on regulation. "Having examined it in the movement, it looks rather simple. The watches perform very accurately, very precisely, but it appears that if you operate the micro-adjuster, it will give you an exact adjustment against an index, which doesn't normally work very well on watches with curb pins-type regulation, which this watch has.

"Normally if you want this precise adjustment, you have to go for free-sprung, where you adjust the weights on the actual balance wheel. When you move the index on all normal watches with a curb pin system, it's a little bit hit-or-miss. So you need a timing machine to do it accurately. This new index adjustment is calibrated so one can make an exact adjustment '+ or -' in seconds per day. This is another step up and they are getting fantastic results from it. It will be interesting to see how it performs as time goes by, as watches come in for servicing."

In keeping with current tastes and demands, B01's power reserve is a generous 70 hours. "Nowadays everyone wants a watch that will run for the weekend; this movement runs for three days when you take it off. More importantly than that, for the first 24 hours of its run, you're using the very

top of the spring's power, so it gives a more consistent torque to the watch. It's a nice bonus that you can take it off for the weekend and it will still be running on Monday, but it's mainly done so the watch uses the better part of the power curve of the mainspring, thus giving better time keeping."

Another nice touch is that Breitling has designed the movement so that it is possible to get to the barrel without taking half the mechanism apart, therefore simplifying a mainspring replacement. In keeping with its price point, the B01's finish is to a high standard, with Cotes de Geneve, snailing, stippling, diamond bevels on the edges and other nice touches.

"So, we have a very fine watch, but a lot more expensive to produce than the TAG Heuer, probably pushing it into a higher price bracket. Interestingly, like the TAG Heuer, the new movement, at the moment, appears only in one range - the Chronomat.

"We're not talking Patek Philippe quality standard of finish on either the TAG Heuer or the Breitling movements - that is unnecessary in their price brackets. But we are still dealing with nice-looking movements finished to superior levels. To me, the Breitling has an excellent finish that fits its price range, as does the TAG Heuer at a lower price point." ◉



This page: The new Chronomat B01 range of chronographs is the first collection to be powered by the new movement.



Further information: www.tagheuer.com www.breitling.com