In the age of megapixels and color spaces we often take the basic components of camera technology for granted. Photographers tend to overlook the ingenuity of the shutter mechanism installed in HC lenses – and yet it is no less of a technical feat than all the other components in the H System.

**SYNOPSIS**
- The H System’s central lens shutter allows for flash photography at 1/800 sec – the camera’s fastest shutter speed. In this area, it outshines the focal plane shutters found in 35mm systems.
- The patented ‘mechatronical’ shutter built in Sweden causes almost no vibration, uses a minimum amount of movable parts and consumes very little energy.
- Super high-tech materials and a sophisticated control board inside every lens ensure superlative operation.
- The shutter is very precise and reliable. Its lifespan extends far beyond 100,000 exposures.
- Hasselblad’s True Exposure mode guarantees correct exposures independently of the aperture setting.

In this article we learn about the central shutter on the H System. The H System’s central lens shutter allows for flash photography at 1/800 sec – the camera’s fastest shutter speed. In this area, it outshines the focal plane shutters found in 35mm systems.

### ADVANTAGES OF THE CENTRAL SHUTTER
There is, in fact, a whole array of positive assets in the central shutter. It allows for approximately three exposure values more flash sync speed than a focal plane shutter. This means flash photography with almost entirely suppressed ambient light, providing the photographer with absolute control over his lighting. What starts out being beneficial in the studio proves to be downright indispensable in some flash scenarios outdoors.

Where the exposure is longer and subjects are moving, available light may lead to an unsharp secondary exposure with blurry contours. The significantly faster sync speeds of a central shutter, on the other hand, freezes any movement far more effectively while also completely suppressing the influence of the ambient light. The photo on the left illustrates the concept: spray water could never have been frozen as effectively in a well-lit studio with the H3D set to a flash sync speed of 1/125 second.

The Swedes are proud of their shutter. It’s one of the H System’s core components and the ‘mechatronical’ device is as simple as it is ingenious. H System users enjoy its unsurpassed precision and versatility. Laymen will ask, what’s the big deal with a shutter mechanism that shoots only 1/800 second at maximum speed? Even amateur cameras with focal plane shutters – installed in the camera, as opposed to every lens – are known to fire away at 1/8000 second.

At Hasselblad in Gothenburg/Sweden, Tomas Johansson, the developer in charge of the central shutter mechanism, cranks a test unit, sets it off and watches it fire away for minutes at incredible speed. “The H camera might not take 20 pictures per second, but that has nothing to do with the shutter,” he remarks with a grin.

#### TECHNOLOGY CENTRAL SHUTTERS

**By HANNS W. FRIEDRICH**

**Photo: Richard Dawson**

Richard Dawson took this picture for GQ magazine using a Hasselblad H3D-39 with the flash set to 1/800 to virtually freeze the spray water.

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The H shutter comes in two types: the smaller 20 mm version (left) has one motor; the larger, more sophisticated 28 mm shutter uses two motors for compatibility with telephoto and high-speed lenses.

sync speed – all depending on the camera system and type of shutter.

Exposures take as long as the flash sync speed, or longer: i.e., even if the shutter speed is set at 1/2000, it might still take 1/125 second for the shutter to perform. Any movement during this time – whether by the camera or the subject – can lead to visible distortion as is frequently seen in sports images. The central shutter, on the other hand, will have nothing to do with this ‘rolling shutter’ effect. It sits in the optical center of the lens behind the aperture. For this reason, it makes no difference that the central shutter cannot open or close with infinite speed. It opens first in the middle and closes last in the middle: the fast, aperture-like opening and closing mechanism has no optical repercussions and doesn’t lead to vignetting.

An added bonus of the central shutter is that it causes virtually no vibration. The forces applied by the tiny, ring-shaped shutter blades are neutralized almost entirely. The two curtains of the focal plane shutter, by comparison, spring off in the same direction only to hit resistance and cause camera shake. Normally, any potential shutter vibration cannot be compared with the more violent flap sound of the mirror inside SLR cameras. However, since the H3D flap sound of the mirror inside SLR cameras can be compared with the more violent potential shutter vibration, the H3D shutter’s influence is neutralized almost entirely. The two motors to move the 0.22 gram shutter blades with a speed equal to that of the smaller model. At 3.5 N and 3.5 kg, the springs call for five times the tractive force, making the 28 mm version far bigger and more sophisticated. An even larger mechanism for even bigger and faster lenses could no longer be manufactured under reliable, economic conditions.

The central shutter is installed inside the lens, back to back with the aperture. There are no side effects from opening the shutter from the middle to the outer sides, first leaving the light through in the middle. The light-weight, high-speed blades guarantee precise exposure speed at 1/800 sec.

**The core piece, a powerful, M-shaped spring, would normally keep the shutter open or closed more dependably.**

**The central principle behind the shutter control system, conceptualized and patented in Sweden, is as simple as it is ingenuous: a mechanism transfers the angular movement of a lever onto the shutter blades.**

**The electronic control mechanism warrants exposure speeds with superior accuracy. It’s highly beneficial in specialized fields like aerial photography where it guarantees 100 percent synchronized exposures using various lenses. It also enables True Exposure. Here, an electronic control considers that the shutter – which opens in a circular fashion from center to edges – clears a small aperture faster than a wide-open one. Since the introduction of the H1, the photographer no longer has to correct the exposure – something even most experienced photographers would overlook – when the aperture is small.

**The H3D shutter is gauged and calibrated individually in the factory.**

**Hasselblad makes no compromises when it comes to the accuracy of the shutter. Internally, the Swedes adhere to far stricter standards than what is dictated by the ISO for medium-format cameras.**

**The amount of fine-tuning invested by Hasselblad engineers, combined with the superior electronic control options, ensures that all shutter speeds remain within the tightest of tolerance margins – barely one-tenth of an exposure value – even though the company’s internal norm would be...**
allow as much as three-tenths, and the ISO even three-tenths discrepancy. In theory, the ISO tolerance norm stocks enough reserves to transform the standard 1/800 into a prestigious 1/1000 second. Mechanically, nothing would even have to change. However, this would go against the Hasselblad philosophy. As it is, the HC lens simply ensures exact exposure speed while keeping sufficient tolerance levels for backup. And it proves to be very reliable and accurate in the field, where consecutive exposures all stay precise within 0.02 exposure values.

**LIVE SPAN BEYOND 100,000 EXPOSURES**

Shutter designer Tomas Johansson hasn’t given up his dream of a ‘real’ 1/1000 second. “All it should take is a bit of extra fine-tuning and modifying. The 1/1000 is on my agenda,” he says. However, the speed issue is rarely even raised by users. There appear to be plenty of other areas that can be improved first – but the shutter mechanism keeps evolving.

The 1/800 second, on the other hand, gives the shutter a markedly long life span. The exact number of exposures is rather open, though it is always likely to extend beyond 100,000 shots. Johansson points toward a shutter that had fired more than 250,000 exposures. Afterwards it continued to perform within the acceptable tolerance margins and, in addition, displayed no wear and tear as it was being disassembled. Since the burden of exposures is distributed across all H lenses, the contingency risk to the shutter is minimal and occurs only rarely. The engineers will then inspect the cause of the defect and use their insights to make improvements.

The shutter and the aperture are mounted back to back. They form the exposure unit, the heart of every HC lens. Hasselblad manufactures both the aperture and the shutter in Gothenburg. Mechanically, the aperture is kept simpler than the shutter. The developers decided to build the new version to greater precision than the previous unit, which had been supplied by a third party. The superior shape is obvious. “When something requires re-modification, we always make sure we do it the Hasselblad way,” Johansson says.

In addition to the mechanical components, the exposure unit has a circuit board that is also used for the autofocus motor. What immediately stands out on the electronic control board are the large capacitors. Similar to a flash unit, they gather the energy to generate the magnetic field. In the 28 mm shutter, the exposure unit is comparatively large and it is difficult to incorporate into the construction. However, the optical department are happy to work with the two, differently sized shutters. The smaller version slots right in without a fuss, while the larger gives birth to high-speed lenses such as the HC 100mm f/2.2. Here, the depth of field at open aperture is spectacularly low, while the speed leaves little room for improvement.

HC lenses are assembled at their partner company Fujinon. The exposure unit itself, being the complex and highly critical component for the correct functioning of the lens, is made in Gothenburg and sent to Japan as a complete unit. All parts are assembled with extreme care; physical dimensions have to be correct and the control lever attached to the blades with utmost precision. The tolerance margins for the various components are abysmal while the demands on the material are very high. The workers involved in assembly all possess exceptional dexterity as tasks can be rather finicky: the blades are mounted using a critical, tiny drop of grease; not enough would result in premature wear and tear; too much oil could end up on the lens. The aperture and shutter are meticulously checked and calibrated before leaving as a finished component on the long journey to Japan only to then return to Sweden as the heart piece of an HC lens.

**CONCLUSION**

Those who believe the shutter to be a simple component wherein a few blades open and close, can remain true to their conviction. In a sense, they are right: the central shutter is as reliable as it is frugal, does exactly what is expected of it and asks nothing more of the photographer than to press the exposure button. The fact that, internally, a number of ingenious controls and magnetic fields are employed to combat mechanical vibration and automatically correct the shutter speed in relation to the set aperture, that the materials can be pushed to the absolute limit and that many clever minds needed many clever ideas and attempts until everything finally works, doesn’t have to concern the Hasselblad photographer. He can concentrate on taking pictures and simply rely on his gear.

For further information please visit www.hasselblad.com