

2023 / TECHNICAL ARTICLE

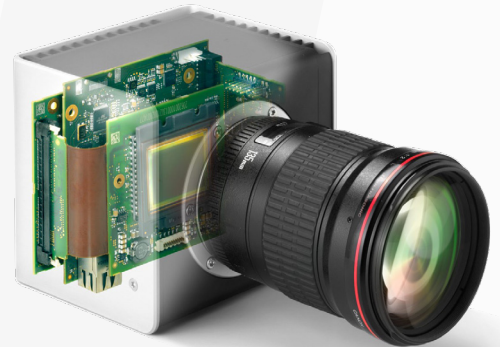
In-house sensor design makes Prodrive Technologies an advanced camera highflier

Prodrive Technologies is a high-tech electronics, software, and mechatronics design and manufacturing company. That combination of capabilities provides a strong foundation for its Advanced Cameras division. Because when you have all that knowledge and knowhow in house, you can make the cameras for the most challenging applications. The upcoming 1 MHz Sonic TDI Linescan camera is Prodrive's new crown jewel, a perfect showcase of our capabilities.

Prodrive Technologies is used to operate under the radar. Modestly developing and manufacturing high-tech electronics, software and mechatronics for its customers for thirty years. The broad set of capabilities that the company has built up in that period, is not something only its clients can benefit from. One of the routes Prodrive is taking to position itself in the market as a product company in its own right, is in advanced and highly specialized cameras.

Marco van Hout, Global Sales Manager for Prodrive's Advanced Cameras product line, explains: 'Our business evolves around two pillars: our own in-house developed standard cameras, and the development of customer specific camera solutions where the IP stays connected to that customer.'

Van Hout is convinced that a 50/50 approach to the business is highly preferable. 'Why do I think that is important? Because when you only develop and manufacture camera solutions for customers, you can't build up your competences. Engineers will move to another project as soon as the assignment is over. But by developing and producing our own cameras as well, we grow our team, we develop our competences, and we become better with every design.'



Prodrive Technologies' chip inside of a camera



Custom sensor integration



Solution focused



Performance



In-house manufacturing

Three target markets

The Advanced Cameras business from Prodrive focusses on three markets: semiconductors, flat panel displays, and life sciences.

'We concentrate our efforts to those three segments, so we can excel at them', says Van Hout. 'Semicon for us is mainly front-end chip manufacturing because that is where the high-end machines are developed. The display market is related to semicon but has its own dynamics as well. In both industries, it comes down to depositing thin layers, either on silicon or glass. Our cameras are used, amongst other things, to check the quality of those layers.' The third market is life science. And that is not the same as medical, Van Hout emphasizes. 'We aim at for instance pathology scanners, DNA sequencing and e-beam microscopy; all applications where our advanced cameras are required.'

Taking an extra step

Prodrive Technologies might be a relatively small player in the camera market, but it has something special to offer. Its systems are used when something different or challenging is required and when standard cameras fall short. When others back out because they deem an application too difficult, Prodrive engineers get excited. The company has been a valued research, development, and production partner of best-in-class cameras for over two decades.

'In the majority of the cases, it begins with the extremely challenging requirements on speed, sensitivity, and resolution, whether it is in DUV, the visible domain, e-beam, or the infrared spectrum. Those characteristics are the starting point of the development', says Van Hout. More often than not, Prodrive then uses an image sensor provided by customers, or it develops one based on their demands. 'Our in-house sensor development, PCBA integration, and our complete manufacturing facilities give us a competitive edge, as they allow us to guarantee the unique features of that specific sensor. Also, when we need to deliver that camera solution for the coming ten years or so, keeping everything in our own hands, especially the most critical sensor, will definitely pay off.'

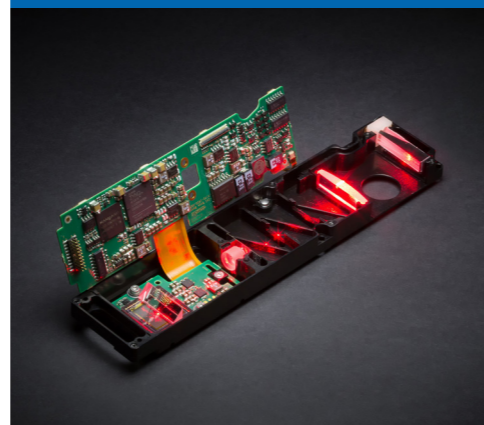
Huge data output

Advanced sensors mean that the data output will be huge. Prodrive cameras produce between 50 and 400 Gigabit per second. 'Typically, it is well above 150 Gigabit/s, much more than standard machine vision cameras that operate at around 20 Gigabit/s', adds Van Hout. That enormous amount of data is necessary for the high-speed applications that the Prodrive cameras are aimed at. 'You don't want to limit the throughput of your multi-million chip machine because inspection is too slow. Also, in DNA sequencing, inspection time is of an essence.'

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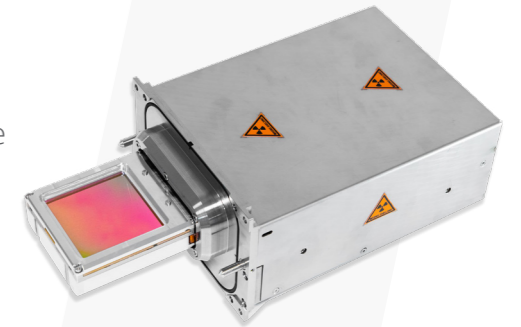
High volume opto-electronics assembly with custom optics and onboard processing

The huge data load would give normal camera manufacturers a headache, but Prodrive has decades of experience in electronics design. 'We build our own customer-specific embedded processing units', says Van Hout. 'Because when you acquire that amount of data, you want to process or preprocess as much as possible, as close as possible to the sensor, before you send them through to a computing cabinet.' Prodrive will advise its customers in the trade-off between raw uncompressed data output and embedded processing power.

Challenging environments

Usually, the applications put constraints on the thermal and mechanical design of the cameras. Think of small systems where the sheer size of the camera can be challenging. 'Also, the high-speed electronics we incorporate, will dissipate quite some heat that has a negative impact on the image quality. So you need to solve that by integrating active cooling or take other precautionary measures', explains Van Hout. 'It is never as simple as ABC.'

It gets even more difficult when the camera has to operate in high or ultra-high vacuum. Coincidence or not, precisely in Prodrive's chosen target markets, vacuum conditions are getting the de facto standard. 'This raises the bar even further for our camera design in terms of cooling', says Van Hout. 'But we are up to that challenge.'



Prodrive Technologies' custom TEM camera for ultra-high vacuum



Prodrive Technologies' Sonic TDI Camera

Fastest TDI on the market

Prodrive has pre-launched an off-the-shelf masterpiece. 'The Sonic will be our flagship', Van Hout says proudly. It is a 1 MHz TDI line scan camera (TDI stands for Time Delay Integration, meaning that multiple line scan cameras are packed together in one system, tremendously increasing the speed of the image collection). The fastest TDI camera commercially available at the moment reaches approximately 350 kHz. 'We are three times faster than the current standard in the market and in the coming years we will broaden our product portfolio even further emphasizing on speed, sensitivity, and resolution', claims Van Hout.

A key factor in the development of this breakthrough product is the fact that Prodrive designs its own sensor and acquisition board. 'Those two components are decisive because they are the most critical parts of the system. At Prodrive, we have comprehensive experience in both. That is what sets us apart.'

The 1 MHz Sonic TDI camera is still in development. Van Hout encounters disbelief when he tells potential customers about the specs. 'I have to convince them that it isn't a typo; we really can deliver that speed', he says smiling. Currently, Prodrive is producing the first prototypes that will be available to some launching customers soon. 'Judging from the number of companies that wanted to get involved in this launching program, I would say the industry is definitely waiting for our TDI camera to be available.' In the second half of this year, a second launching program will take place. Mass production starts next year. Van Hout: 'Many people I talk to ask me to be faster. That is, faster to the market, because they are desperately waiting to incorporate cameras with such a high speed.'

Discover more about Prodrive Technologies' solutions for Advanced Cameras:

[Advanced Cameras](#)

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