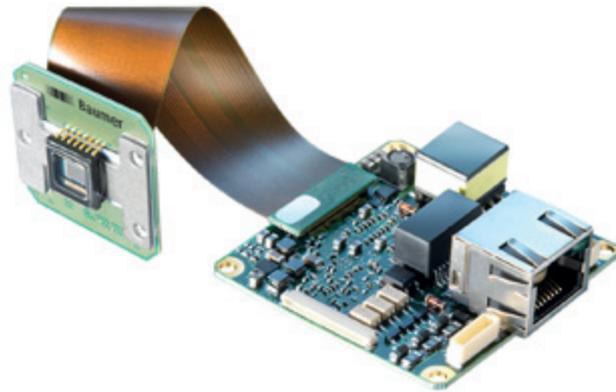


Board Level Cameras – Unlimited Flexibility

A lot of performance in a tight space. In more and more areas, camera systems are needed that fulfill these requirements. The new series of board level cameras from Baumer is specifically used when a traditional camera design does not provide sufficient flexibility – and fits even in the smallest of installation spaces.



Digital board level cameras are especially in demand for machines and systems in which a standard camera reaches the limits of its flexibility and where every single millimeter of installation space counts. Grouped under the category 'Board Level Cameras' are camera systems that consist of one or more circuit boards, without them being enclosed by a housing. In the case of one-piece cameras, optics and electronics are permanently connected with each other. However, if the sensor circuit board is spatially set off from the system circuit board with a flexible cable connection, this is referred to as a segmented board level variant.

Varied all-round talents

At the beginning of the digital industrial camera age, the installation space needed as well as the form factor still were of secondary importance. Nowadays, however, especially plant and machine construction companies need high-performance cameras to live up to the increasing requirements of their customers. Due to increasing miniaturization, the market especially for ever smaller, optical inspection system keeps growing constantly. Board level cameras can be used in a multitude of ways for traditional industrial inspection tasks in production, assembly and quality control. They are used in packaging and pharmaceutical solutions, in the textile and semiconductor industry as well as in robotics or special-purpose machine construction. But also in the solar industry sector, camera-based systems for the inspection of solar

cells and panels by way of electro or photo luminescence process are gaining more and more ground. The flexible allround talents are also used in the automated manufacturing of circuit boards. But industrial applications are not the only ones facing the challenges of small installation spaces with lots of nooks and crannies. With increasing frequency, the space-saving cameras are also used in non-industrial areas and devices, such as in medical technology, when in ophthalmology the cornea's ablation profile needs to be calculated for the laser. Or also for intelligent traffic monitoring and guidance systems, e. g. to perform the recording of license plates.

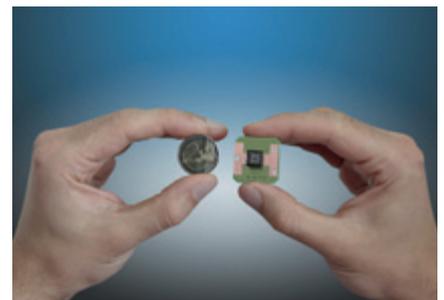
Freely positionable image sensor head for more degrees of motion

Small cameras with a protective housing do not always provide the design engineers with the desired degree of freedom with respect to positioning. The housing design specified may even require a cost and time intensive adjustment of the entire system. This is where board level cameras come into play. With respect to adaptability to the respective installation situation, multi-part cameras are even more flexible than their all-in-one counterparts. For one, their circuit board format, most of the time, is smaller and can thereby be integrated more easily, and for another, due to the spatially set off sensor circuit board considerably

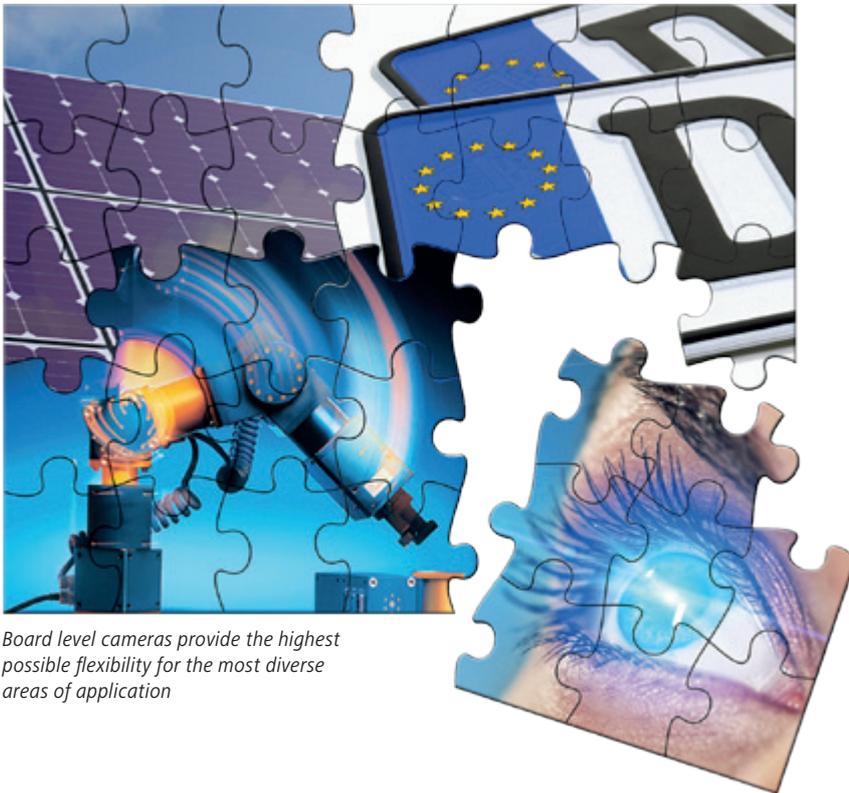
more positioning variants may be obtained. For example, in the application multiple sensors may be placed in close proximity to each other so that a seamless inspection can be assured. Even though the board level devices do not come with a camera housing – they provide many advantages. But it also results in increased susceptibility. The cameras are, for example, not as well protected against electromagnetic interference. Therefore, measures such as EMC shielding also have to be implemented during the design of the plants and machines.

Separate, yet united

The new MXG series of Baumer are multi-part board level cameras. The sensor circuit board, with its dimensions of 28 x 28 millimeters, is barely larger than a 2-Euro coin. This sensor circuit board is connected to a system circuit board of



The sensing head with its dimensions of 28 x 28 millimeters is barely larger than a silver dollar.



Board level cameras provide the highest possible flexibility for the most diverse areas of application

48 x 48 millimeters by a so-called flexprint, a ribbon cable like circuit board of variable length. That's way, an easy integration into the application environment and the existing installation space situation can be assured. This flexibility is achieved by digitizing the analog data provided by the sensor directly on the sensor circuit board and only thereafter transmitting the data to the system circuit board. On the latter, all of the camera's interfaces are integrated, the Gigabit Ethernet interface, the digital input and output, as well as the power supply. The board level systems may be provided with external power or via Power over Ethernet (PoE). The camera components' innovative ground and shielding concept, in combination with the integrated protective wiring of the inputs and outputs, provides for far-reaching protection against interfering electromagnetic influences. Baumer will offer eight models in the new series of cameras – 4 each of monochrome and color cameras with resolutions ranging from VGA to 4 megapixels. In addition to the powerful CCD sensors ICX618 (VGA), ICX445 (1.2 MP) and ICX274 (2.0 MP) by SONY, there will also be – for the first time in a board level camera – the 4 megapixel CMOS sensor CMV4000 by CMOSIS used. That sensor, which features a square 1:1 aspect ratio (2048 x 2048 pixels), sets new standards in the area of board level

cameras with its high sensitivity and excellent dynamic range. The first camera model of the new series, featuring VGA resolution and frame rates of up to 140 full frames per second, has been introduced at VISION Show 2011 in Stuttgart, Germany.

Full functionality at increased flexibility

The flexibility of the new board level devices also continues in their scope of functions. They are GigE Vision® 1.2 compliant. For easier synchronization between application and camera, Baumer also integrated a featured Trigger Delay which makes the highly accurate positioning of trigger sources such as light barriers within the system obsolete. Configurable debouncers filter invalid signals such as spikes out at the trigger input and thereby considerably reduce the expenses for interference suppression measures. The acquisition of series of pictures with changing acquisition parameters is made considerably easier through the use of a sequencer and can be performed in response to one or more trigger signals. The color variants of the new camera series feature the internal color computation – already well known from Baumer's other camera models – for an excellent color reproduction. For a smooth data transfer in multi-camera operation, the new board level cameras are also equipped with "Transmission Delay" in addition to

the "Packet Delay" process which widens the data stream through so-called inter packet gaps. The individual cameras' data transfer to the PC takes place sequentially in this case. As a result, substantially reduced transmission times can be achieved when using cameras with different sensor resolutions. By consistently adhering to the GenICam™ 1.0 standard, all cameras can not only be configured via the Baumer-GAPI generic programming interface, but also via third party tools, and be easily integrated into any image processing solution. This ensures the flexible use in user-specific applications. Further opportunities for simplification with respect to camera integration result from loadable and storable user sets, within which each configurable camera parameter is stored and which can be applied to multiple cameras. In addition to the high flexibility and the easy and cost-effective system integration and maintenance – already known from Gigabit Ethernet – the new board level cameras also feature cost advantages in comparison to traditional standard cameras. Furthermore, they provide plant and machine construction companies with a broad range of flexible opportunities for use.



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