

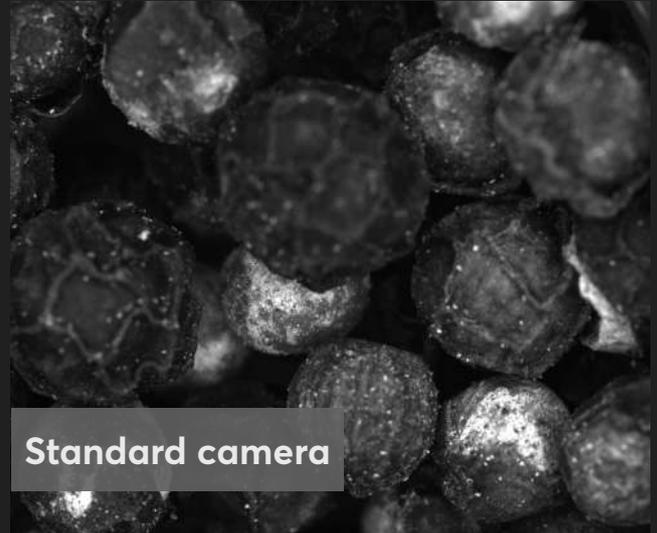
Invenira



Focus X

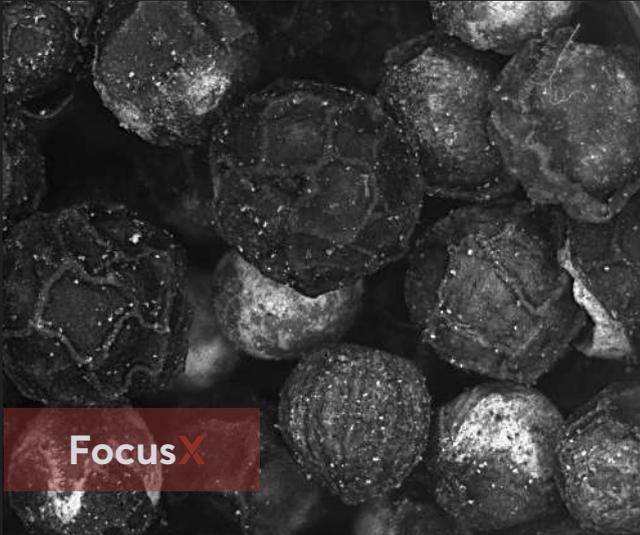
Revolutionizing vision

Sharply imaging three-dimensional, moving, or inclined objects is known to be a real challenge. Cameras equipped with conventional optics always struggle to keep the entire scene in focus when a lot of details need to be captured. The problem is their limited focus depth, also called depth of field (DOF). Setting a higher DOF will result in less detailed images. Likewise, when a higher resolution is set, the DOF will decrease. This physical limitation is one of the biggest problems in vision across industries as it severely impacts productivity and efficiency.



But what if it *would* be possible to capture images with a large DOF and a high resolution at the same time? And what if such images could be captured in the blink of an eye? Think of the enormous reduction in costs that could be realized during production and inspection processes because of the time being saved. Or imagine the great amount of detail that could be uncovered when imaging large samples under a microscope. And envision the superior clarity and smoothness with which fast moving objects could be captured.

across industries.



Invenira has developed FocusX to achieve exactly these goals. FocusX is a unique vision technology that allows imaging at the resolution of conventional optical systems, while increasing the DOF up to 20 times. Moreover, it can acquire images in one shot, within one camera frame. FocusX does not require any mechanical scanning, deformable lenses or special illumination, making it a highly reliable and easy-to-integrate vision technology. As a result, the FocusX technology can be embedded into almost every conventional optical system.

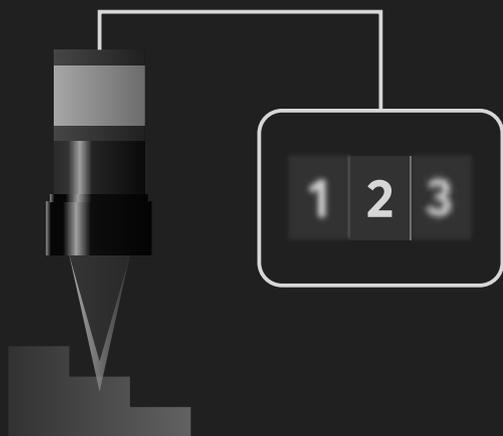
FocusX outperforms all existing technologies in its class. This is made possible with Invenira's patent-pending optics and proprietary image processing algorithm. There is a vast number of applications for this technology, including: microscopy, quality control, metrology, optical character recognition, bar code reading, flow cytometry, laser scanning, 3D vision and particle imaging velocimetry. Invenira offers an evaluation kit that allows companies to determine whether the FocusX technology fits the requirements of their application.



Challenges in conventional systems

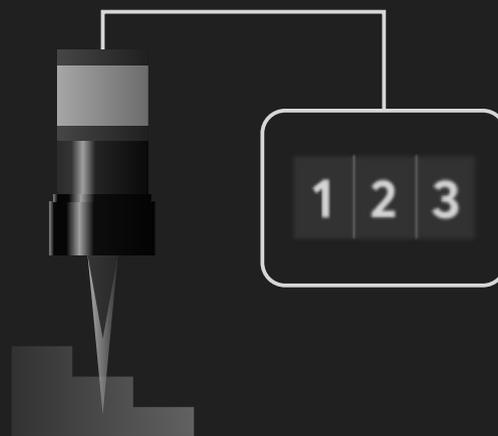
HIGH RESOLUTION

Low depth of field



HIGH DEPTH OF FIELD

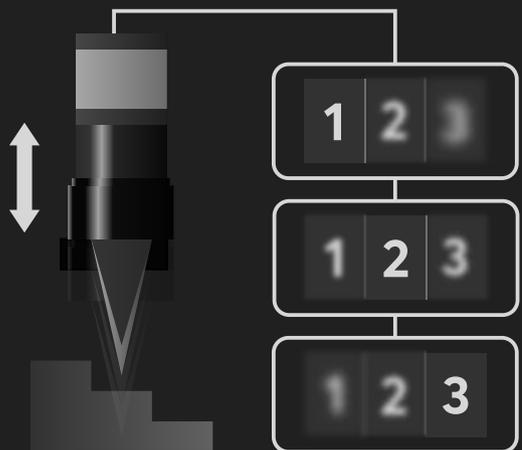
Low resolution



Object

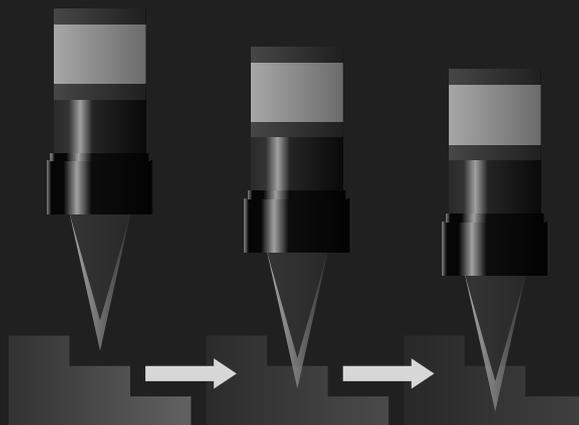
MECHANICAL SCANNING

Slow motion, multiple images needed

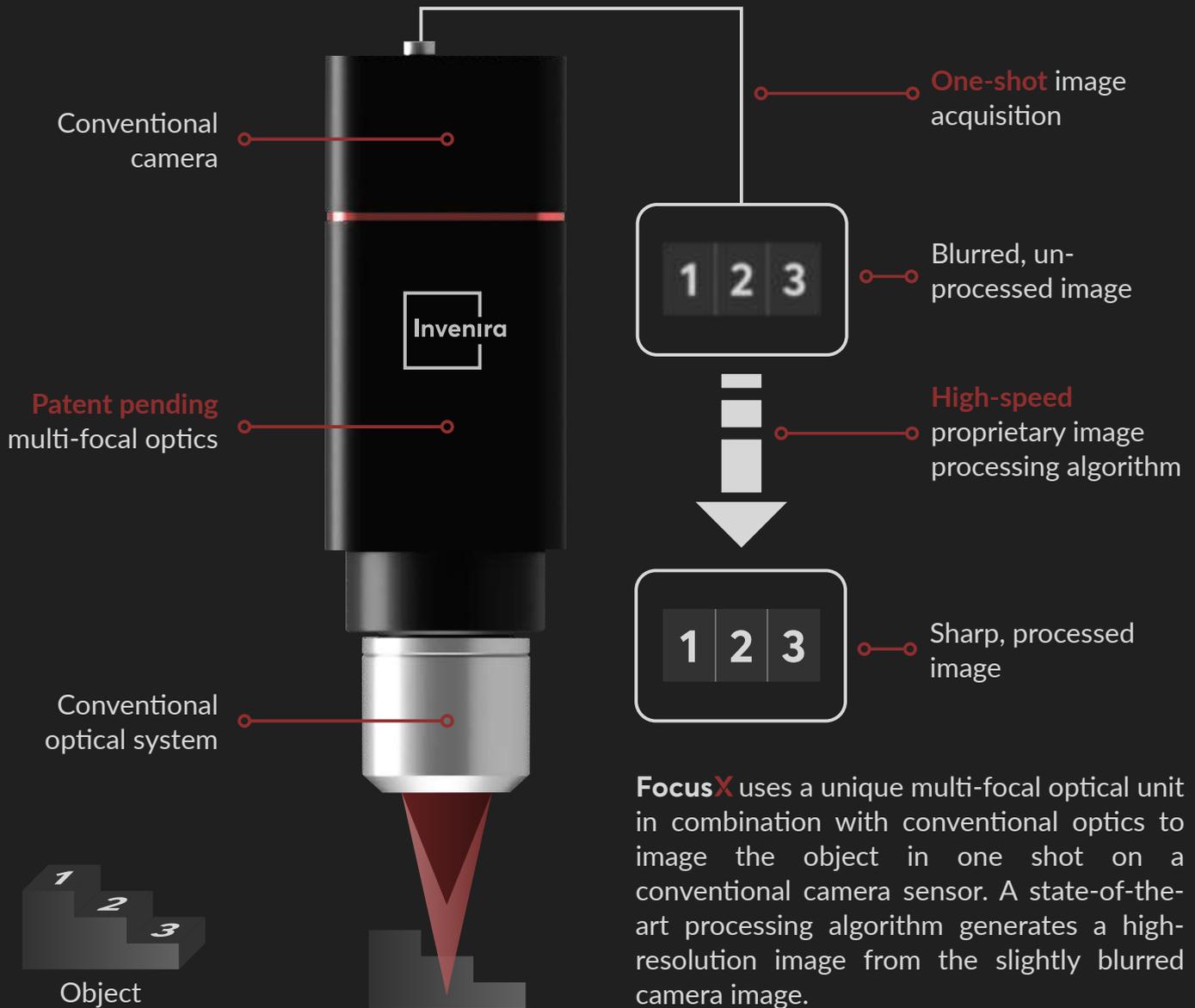


MULTIPLE CAMERAS

Space consuming, alignment issues

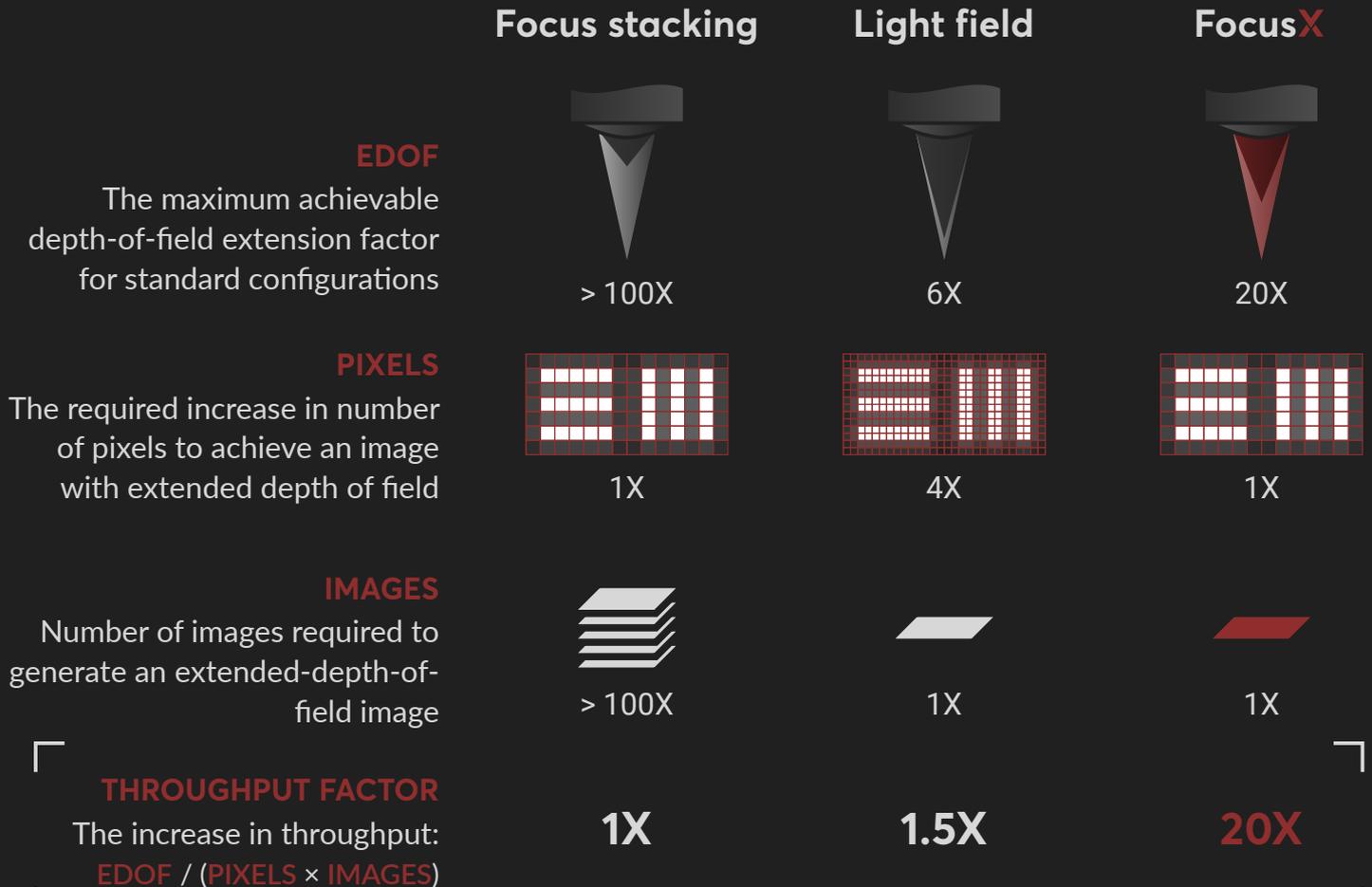


One-shot extended depth of field



FocusX uses a unique multi-focal optical unit in combination with conventional optics to image the object in one shot on a conventional camera sensor. A state-of-the-art processing algorithm generates a high-resolution image from the slightly blurred camera image.

Extreme throughput



FocusX increases the **throughput up to 20X** compared to what is achieved with other extended depth of field technologies by combining a **large depth of field** with a **high resolution** and **single-shot acquisition**.

Benefits

EXTENDED DEPTH OF FIELD

Up to 20X the depth of field of a diffraction-limited imaging system can be reached.

ONE SHOT, HIGH SPEED

Only one camera frame is required to generate an EDOF image. This allows capturing images at the camera frame rate, which enables capturing moving objects with large height differences while staying in focus.

HIGH RESOLUTION

Diffraction-limited resolution is achievable. The system can even be configured to attain superresolution.

ANY LIGHTING

Works with conventional lighting configurations, both monochromatic and broadband, at any wavelength.

HIGH RELIABILITY

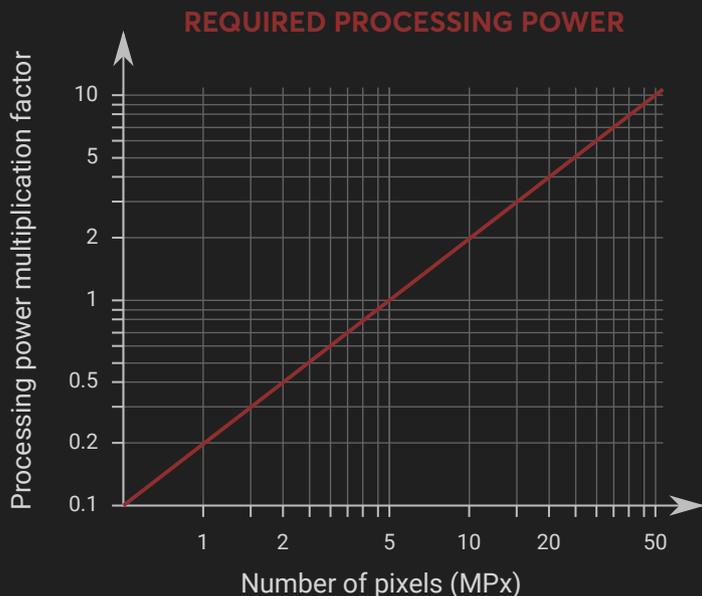
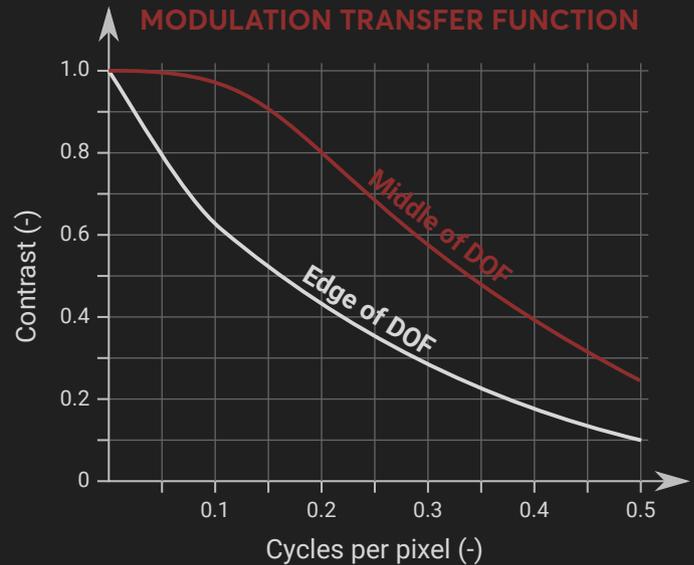
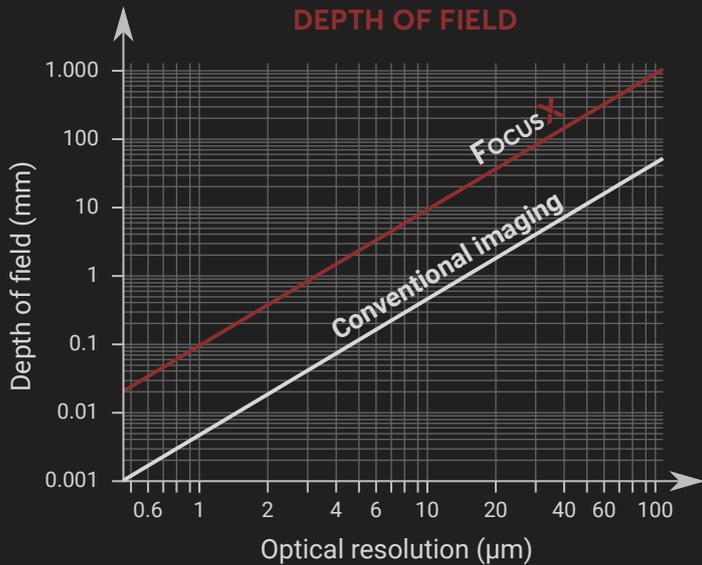
The optical technology consists of non-moving, passive optical components in a compact unit.

EASY INTEGRATION

The optical technology can be integrated into the optics of a dedicated design or as an add-on to an existing imaging system.



Technology capabilities



The **FocusX** technology extends the **depth of field** up to 20 times compared to a conventional diffraction limited system, given by λ / NA^2 . Depth of field and optical resolution can be tailored to the application.

The **Modulation Transfer Function** graph shows the contrast, which by default is optimized to at least 0.3 at the optical resolution (0.3 cpp). The MTF can be designed to any profile.

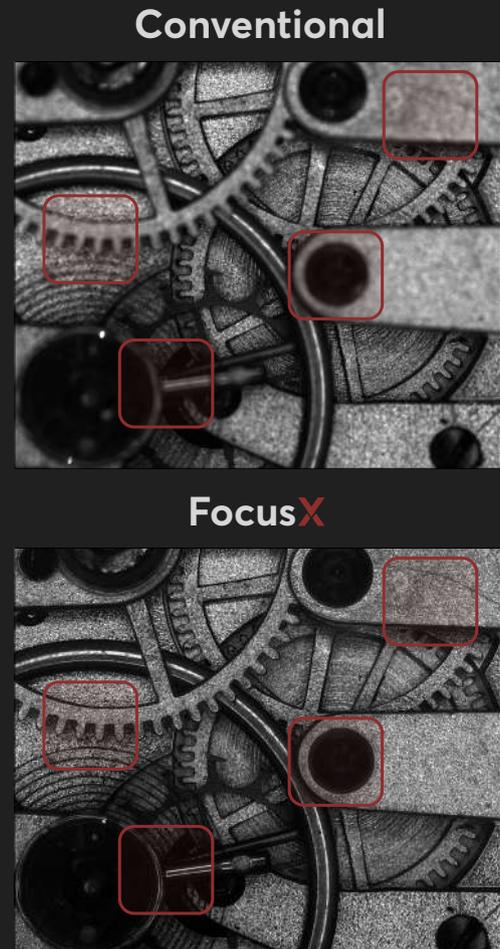
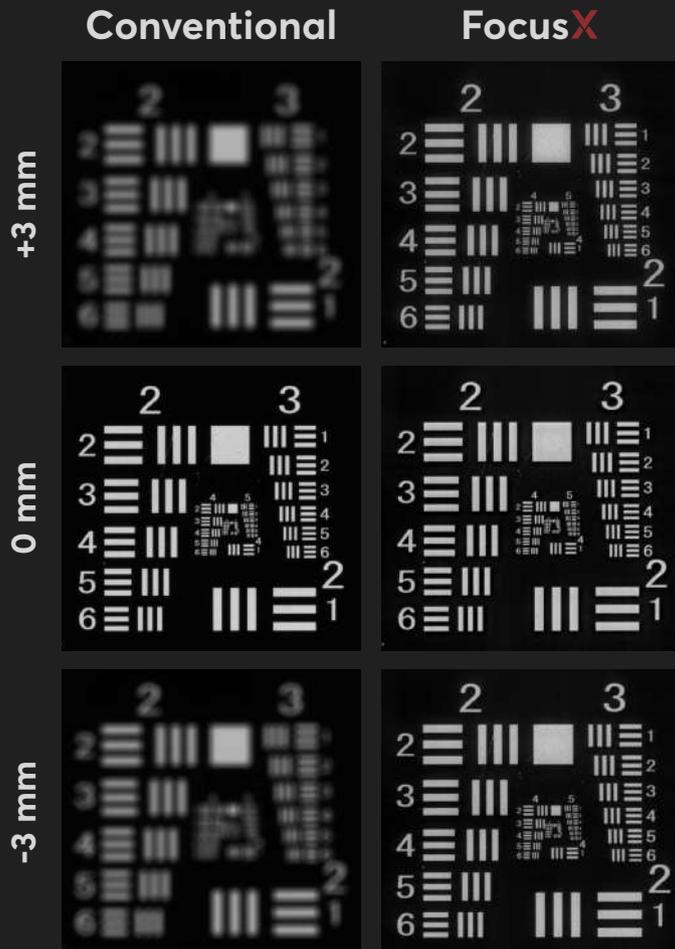
The required **processing power** scales approximately linear with the number of camera pixels. Doubling the number of pixels requires doubling the amount of processing power to achieve the same frame rate.

Images

The following images compare the performance of a **FocusX** imaging system with that of a conventional imaging system. The key specifications of both systems are summarized in the table on the right.

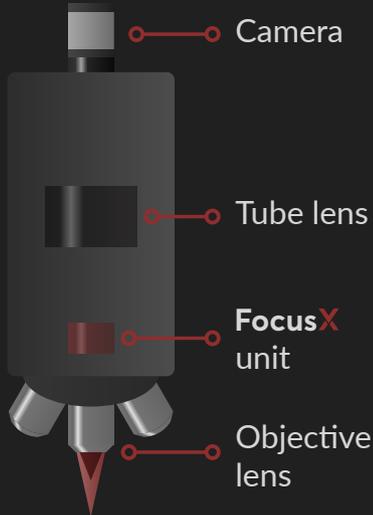
	Conventional	FocusX
Pixel resolution (mm)	7.9	7.9
Resolution (μm)	11	11
Depth of field (mm)	0.60	6.0

FocusX is available with other specifications, incl. higher DOF extensions.



Integration

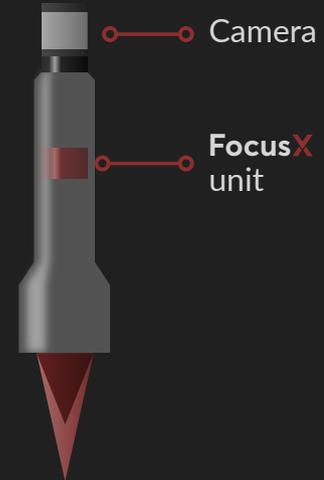
MICROSCOPES



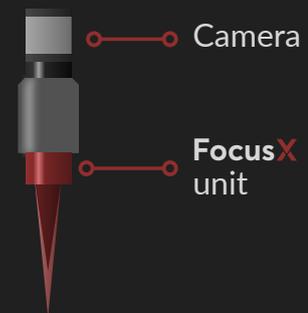
SYSTEM ADD-ON



TELECENTRIC LENSES



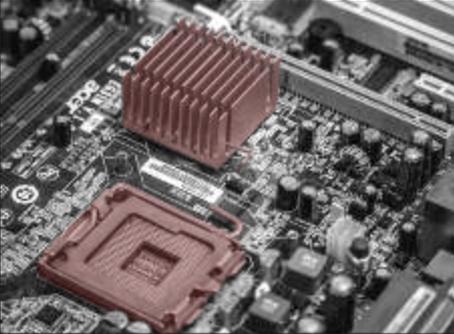
FIXED FOCAL LENGTH LENSES



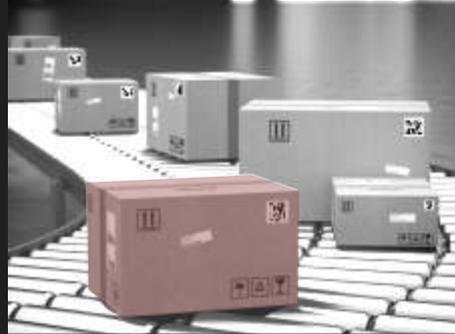
The **FocusX** technology consists of a compact optical unit, which can be integrated into any optical system. For example, the unit can be embedded into a telecentric lens or a microscope, or it can be added at the front of a conventional fixed focal length lens. Another option is to replace the camera of an existing system with a FocusX add-on system.

Applications

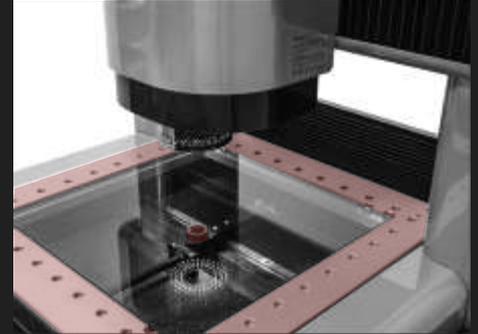
SEMICON PRODUCTION



QR CODE READING



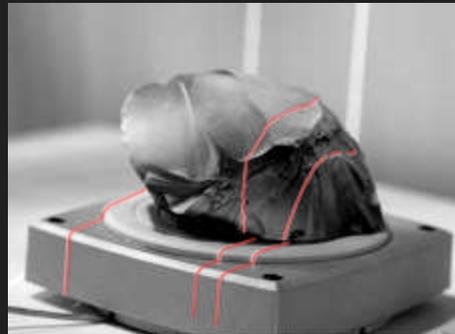
OPTICAL METROLOGY



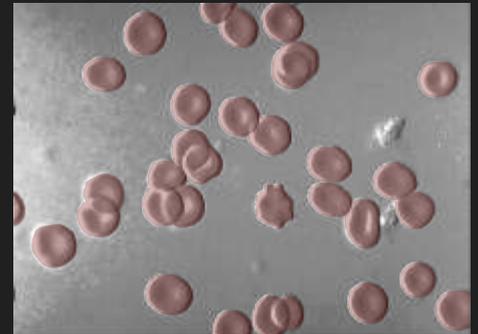
3D VISION



LASER SCANNING



FLOW CYTOMETRY



QUALITY CONTROL



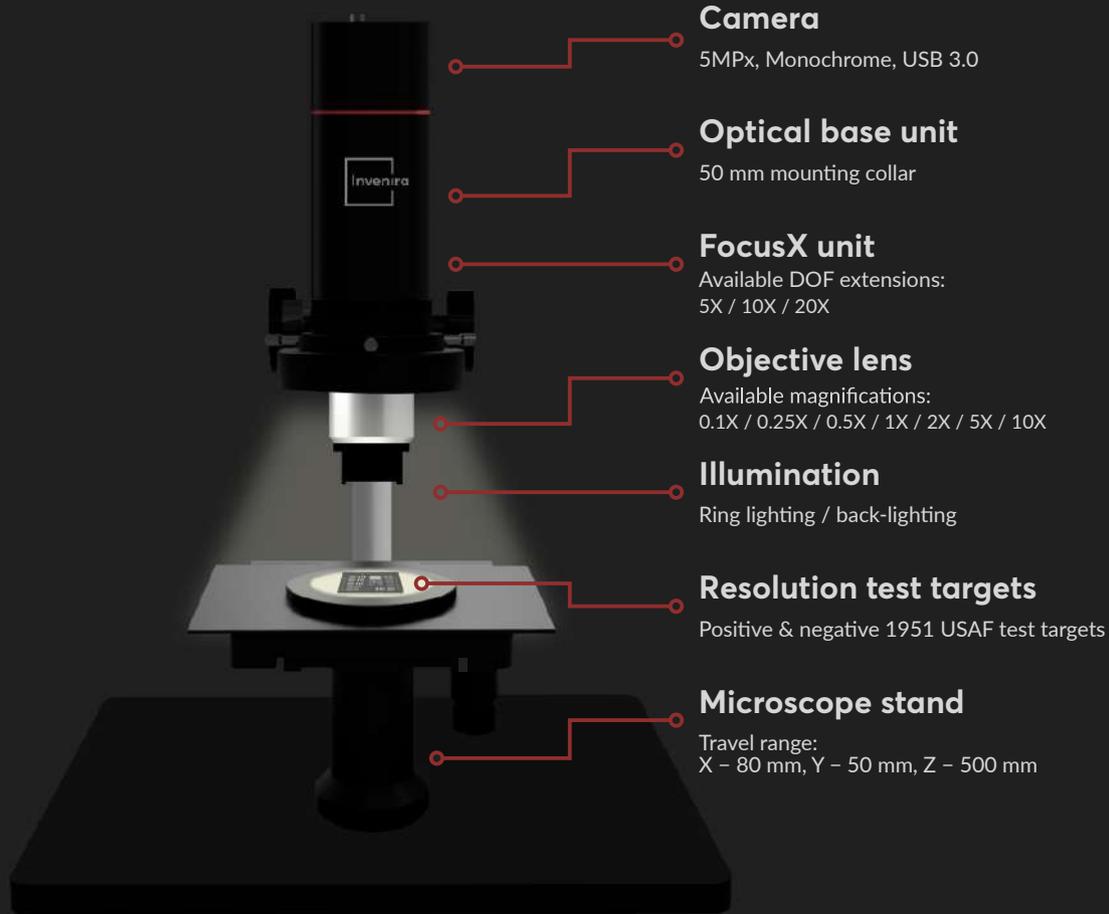
PARTICLE DETECTION



YOUR APPLICATION



Evaluation Kit



Invenira offers an evaluation kit that allows you to explore the possibilities and performance of the FocusX technology first hand. The evaluation kit includes all essential components, a number of optional components depending on your interests and applications, a range of accessories to facilitate fast testing and easy-to-use software for image capturing, processing and analysis.

Evaluation Kit

The software that is included in the **FocusX** Evaluation Kit allows you to capture camera images and process them in real-time with the FocusX algorithm. The key parameters of the algorithm can be set according to your application with the aid of an easy-to-use graphical interface. Other functionalities include saving raw and processed images, capturing video sequences, loading previously captured images for post-processing and analysing images.



The following table gives an overview of the available options for the **FocusX** Evaluation Kit.

Magnification	0.1X	0.25X	0.5X	1X	2X	5X	10X
Field of view (mm)	110	44	22	11	5.5	2.2	1.1
Resolution (μm)	55	22	11	5.5	2.8	1.1	0.6
Depth of field - 5X (mm)	75	12	3	0.75	0.19	0.030	0.0075
Depth of field - 10X (mm)	150	24	6	1.5	0.37	0.060	0.015
Depth of field - 20X (mm)	300	48	12	3	0.74	0.120	0.030
Camera resolution	2054 x 2456 px						

For more information, please check the corresponding **FocusX** Evaluation Kit datasheet.



Book your FocusX demo
www.invenira.com



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