



IMMERSION LENSES TECHNOLOGY

– UNIQUE TECHNOLOGY FROM VIGO SYSTEM

There are many ways of improving detector parameters with the use of optical devices (including, amongst others, optical cones, concentrators), but only the optical immersion used by VIGO System enables improving the detectivity of a detector in the simplest way possible - without losses, without aligning, and at a very small expense.

WHAT IS OPTICAL IMMERSION?

① Optical immersion means the use of a certain type of lens, which is an integral part of an IR detector. The lens enables collecting an amount of optical radiation falling on the device larger than the one that could be collected only due to the physical area of the device. As a result, the detector picks up more usable signal - as much as a larger device - while retaining a smaller area.

WHAT ARE THE UNIQUE FEATURES OF THE VIGO SYSTEM LENSES?

③ At VIGO System, the optical immersion is created directly with the use of the substrate on which the active layer of the detector is placed. This means the lens is an integral part of the device - no adhesives or other joints that could generate losses are used for its fabrication. A monolithic lens does not need to be aligned by the customer in any way, and it reaches its maximum efficiency already during the manufacturing process. This is a unique technology developed and used in IR detectors solely by the VIGO System company.

WHAT IS THE ADVANTAGE OF USING A SMALLER DETECTOR?

② The answer is a noise reduction. A smaller detector area means a considerable decrease in the level of noise level generated by the device.

TO WHAT EXTENT CAN PARAMETERS OF A DEVICE BE IMPROVED WITH OPTICAL IMMERSION?

④ The degree of detector parameters improvement depends on the material from which the immersion lens is made. Generally speaking, the detectivity of a device is improved: - n times if a hemispherical lens is used - n^2 times if a hyperhemispherical lens is used where n is the refractive index of the lens. In the VIGO System detectors comprising a GaAs substrate and an integrated immersion lens made of the same material, the refractive index of the lens is equal to 3.3. That means the detectivity is improved 3.3 times in a detector with a hemispherical lens, and nearly 11 times in a detector with a hyperhemispherical lens. Both types of lenses (hemispherical and hyperhemispherical) are available from the VIGO System products catalogue. A hyperhemispherical lens is of-

ferred as a standard. It needs to be stressed that if a hyperhemispherical lens is used, the angle of view (acceptance angle) of the detector is limited to 35 degrees, which may be a significant limitation as far as certain applications are concerned. The acceptance angle of a detector with a hemispherical lens remains unchanged and is 180 degrees.

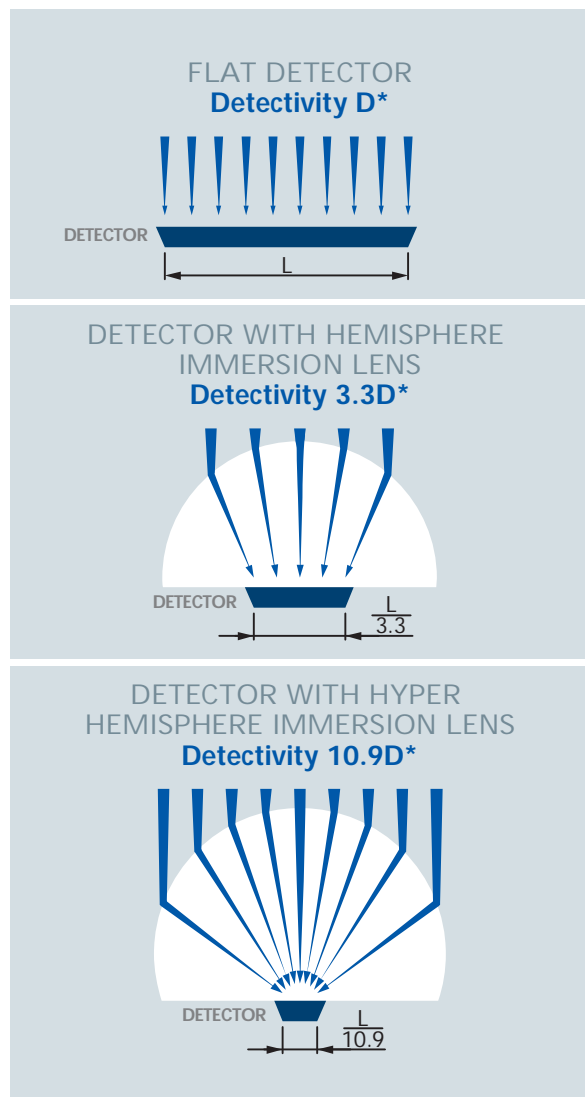
FOR WHAT APPLICATIONS IS THE OPTICAL IMMERSION RECOMMENDED?

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A detector with an immersion lens is best suited for operation with low power of optical signal, which means the applications where the highest detectivity of the detector is required. The use of optical immersion enables improving the signal-to-noise ratio almost 11 times without any need for additional customer's interference with the measurement system. It needs to be stressed that although the use of optical immersion gives extraordinary results in applications with low signal levels, if strong sources of radiation are used, an immersion detector does not need to be necessarily chosen. Why? If the optical signal is strong enough, the high power of radiation enables equalizing the signal-to-noise ratio in a flat detector without a lens, just as if the immersion technology was used.

Detailed information on immersion detectors, as well as assistance in selecting a detector for your applications is available from local distributors or from the sales force of the VIGO System company. ■

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SUMMARY

- immersion lenses are optical elements that improve the detectivity of an infrared detector
- the lenses used at VIGO System generate no losses, require no alignment, and offer maximum efficiency immediately after they are manufactured
- the immersion may limit the angle of view of a detector (this applies to hyperhemispherical immersion lenses)
- detectors with immersion lenses are perfect for applications where the power of the radiation source is low, and for applications where the detector's detectivity is the most important parameter.