Laser focus
Built-in instant focus
# Table of contents

1. What is a laser? 3
2. Laser focus 4
3. Challenging lighting conditions 5
4. Safety 6
5. Conclusion 6
6. Acronyms and abbreviations 6
7. Useful links 6
1. **What is a laser?**

A laser is a light source that emits coherent and monochrome light rays, all aimed in the same direction. This means that all emitted light waves have the same size and shape (coherence) and color (wavelength). The emitted light does not have to be visible, but can be electromagnetic radiation with any wavelength, for example infrared (IR) or ultraviolet (UV) light. IR light has longer wavelengths (700 nm–1 mm) compared to visible light (400–700 nm), whereas ultraviolet light have shorter wavelengths (10–400 nm).

The coherence of the light enables the laser beam to stay narrow over great distances, making it suitable for industrial applications such as laser pointers, laser sights, and laser focus. As a comparison, normal light, such as the light from a common light bulb, contains many colors or wavelengths, and the emitted light waves do not have the same phase, as shown in Figure 1.

The laser light used in the laser focus feature is not visible. Instead, the laser uses IR light with a longer wavelength than visible light. The laser waves are created by stimulated emission and the term 'laser' is an acronym that means 'Light Amplification by Stimulated Emission of Radiation' (LASER).

![Laser light](image)

![Normal light](image)

*Figure 1: Difference between normal light and laser light.*
2. Laser focus

Laser focus helps cameras find focus even faster than cameras with autofocus only. It finds focus in
challenging lighting conditions, such as scenes with low light or contrast. The out-of-the-box-ready
feature is a fully automatic solution, requiring neither setting nor programming to work. As soon as the
camera is turned on, the laser focus starts working.

![Image of camera with laser focus](image1)

*Figure 2: Example of a camera with laser focus.*

The laser focus feature includes a laser that assists focusing by providing a reference point. The laser
module has a transmitter and a receiver, as indicated in Figure 3. The transmitter sends out a laser ray
that bounces off an object and returns to the receiver, providing the camera with a focus reference
point. The IR light of the laser focus is neither visible nor harmful, and has a wavelength of 905 nm.

![Image of camera with laser module](image2)

*Figure 3: Example of a camera with a laser module.*
The laser focus feature verifies focus continuously when the scene changes. Since the camera already knows the distance to the object, it knows where to start searching, and the entire process is performed automatically within a fraction of a second.

3. **Challenging lighting conditions**

Some lighting conditions can pose a challenge to the autofocus feature, as described in the following sections. *Laser focus* is a solution to the problem with these conditions, as it finds focus instantly regardless of them.

The most common light conditions where autofocus may have difficulties finding focus are scenes with low light or low contrast, and scenes with point-shaped light sources, such as strong headlights from traffic. Figure 4 shows an example of a scene with several point-shaped light sources and low light.

Scenes with low-contrast objects, for example, flames or smoke, do not provide the sharp edges and high contrast that autofocus searches for when trying to focus. A white wall that lacks contrasting edges or objects is another example of a scene with low or non-existing contrast.

In dark environments, edges do not look as sharp as they would in bright lighting conditions, that is, the contrast is lower. In addition, image noise is proportionally higher in low-light scenes. The noise covers objects and hides their sharp edges, impairing the ability of autofocus to find focus.

*Figure 4: A scene with several point-shaped light sources and low light.*

The *laser focus* feature makes it possible to focus on bright objects or objects that reflect a lot of light, for example, solar panels, that autofocus may find challenging since the reflecting light blurs or hides the sharp edges that autofocus needs to be able to focus.

With moving objects and scenes that change quickly, laser focus will find focus instantly, making it possible to focus, for example, on the license plate of a moving vehicle, see Figure 5.
Laser focus is especially useful for pan/tilt/zoom (PTZ) cameras since the view changes dynamically when the PTZ function is used.

See Section 7, Useful links, for more information on PTZ cameras.

4. **Safety**

Laser focus meets the international laser safety standard IEC 60825 Class 1, which ensures that the kind of laser used in the laser focus module is safe under all conditions of normal use. Even if the user looks straight into the laser transmitter with their naked eye or through a magnifying glass, telescope, microscope or similar, they will not be injured. Thanks to the safety of the laser, it is perfectly safe to use cameras with laser focus in public areas such as shopping malls, airports, and stadiums.

5. **Conclusion**

Laser focus is a completely automatic feature that is active whenever the camera is on. It provides instant sharp focus, also in challenging lighting conditions, and it is safe to use under all conditions. Even if someone looks straight into the laser, their eyes will not be harmed by its light.

6. **Acronyms and abbreviations**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
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<tr>
<td>IR</td>
<td>Infrared</td>
</tr>
<tr>
<td>LASER</td>
<td>Light amplification by stimulated emission of radiation</td>
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<tr>
<td>PTZ</td>
<td>Pan/tilt/zoom</td>
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<td>UV</td>
<td>Ultraviolet</td>
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7. **Useful links**

For more information, see the following link:


*Part of the license plate has been blocked for privacy reasons.*
About Axis Communications

Axis offers intelligent security solutions that enable a smarter, safer world. As the market leader in network video, Axis is driving the industry by continually launching innovative network products based on an open platform - delivering high value to customers through a global partner network. Axis has long-term relationships with partners and provides them with knowledge and ground-breaking network products in existing and new markets.

Axis has more than 2,100 dedicated employees in more than 50 countries around the world, supported by a global network of over 80,000 partners. Founded in 1984, Axis is a Sweden-based company listed on NASDAQ Stockholm under the ticker AXIS.

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