

## Introduction

Traditional machine vision applications rely on consistent and repeatable lighting conditions to ensure accurate measurements and reliable system performance. These applications are most often indoors. With the introduction of long cable length interfaces, such as GigE Vision, distances between cameras and host PC have increased considerably. Long cable length interfaces are taking machine vision systems into remote environments, often outdoors where scene illumination is unpredictable and remote lens control is critical.

The Prosilica GI supports DC and Precise Auto iris (P-iris) lens control. Using the lens control port on the side of the camera users can control and automate the iris position via the Ethernet interface used for image streaming and camera control.



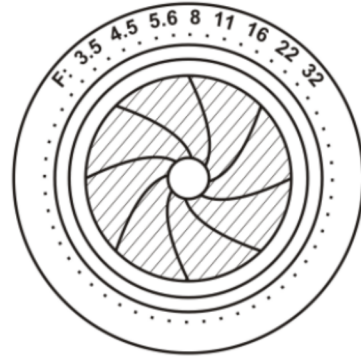
## P-Iris lenses

Developed for digital cameras, P-iris lens control relies on stepper motors. The motor offers several hundred positions depending on the manufacturer. Every step position represents a particular F-number, a common term in photography, used to reference the size of the iris opening. Lenses which offer P-iris support are currently offered by to Kowa with Schneider and Computar indicating new products will become available shortly.

## Remote F-number adjustment

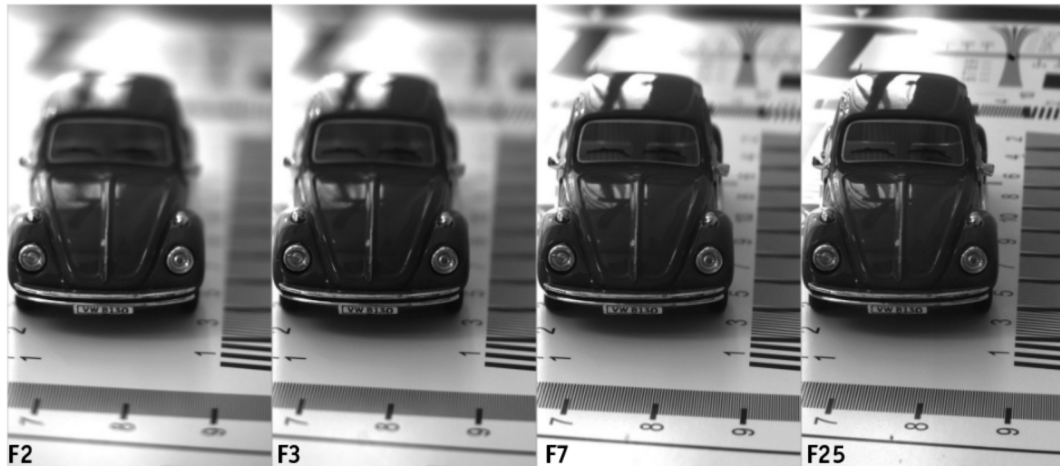
A low F-number such as F1.4 allows the most amount of light onto the sensor, essential in darker conditions. F16 on the other hand, is a comparatively smaller iris opening and limits the amount of light directed at the sensor. A smaller iris opening is preferred during bright sunny days to eliminate blooming, smearing or ghosting effects in CCD and CMOS sensors. A higher F-number leads to increased depth of field, improving the ability to maintain focus across a longer working distance from the camera.

P-iris lens control supported by the Prosilica GT camera enables remote adjustment of lens F-number to enable users to optimize on the iris opening during changing lighting conditions.



## Increase depth of field

Capturing a focused and balanced image is critical for any imaging system. When working distances vary, maximizing the depth of field is often desirable. Depth of field defines a measure of distance in which the object remains in focus. Figure 1 demonstrates the impact of changing camera F-number on the depth of field. Notice the image on the far left, F2.0 shows a blurry image behind and in front of the model car license plate. As the F-number is increased and the iris is closed, depth of field increases until in the far right image F25, most of the model car is in focus. This means the depth of field has been increased. This focusing depth can now be optimized for different scenarios using P-iris lens control.



**Figure 1:** Depth of field comparison across changing F-number

## Freeze iris position for triggered capture

P-iris relies on stepper motor technology to adjust the iris position. These motors enable the iris to stay frozen between image captures. This makes P-iris well suited for asynchronous triggering situations. This is the case whenever an external trigger is used with the camera to start image capture for single or multiple images.

In traffic applications such as tolling, a ground loop, radar or laser trigger system can be used to limit the number of images to those that contain vehicles. This means image capture is not continuous but rather a series of sequence captures which vary in frequency depending on traffic conditions. As opposed to Video or DC auto iris lenses that experience iris drift between captures, P-iris will stay in position between triggers.

## DC auto iris lenses

This is a well established lens control scheme originally used in the surveillance and security market. Initially developed for analog camera systems, a continuous video signal is used to control the opening or closing of the iris. Movement is initiated using a single direction DC motor while a spring is used to return the lens to its rest state.

Lenses which offer DC auto iris motorized control are available from a variety of manufacturers including, but not limited to: Fujinon, Tamron, Kowa, Computar, and Pentax.

## Analog surveillance to outdoor digital imaging

Allied Vision has enabled DC lens control on digital cameras by calculating the image mean using algorithms in the FPGA. The mean signal is translated into a reference voltage signal connected to the lens. This is used to determine if the iris needs to open or close. Users will be able to control the rate at which the iris can close or open as well as define the target brightness of the scene.

## Additional References

Technical manuals and GigE feature reference

<https://www.alliedvision.com/en/support/technical-documentation>

For technical support, please contact [support@alliedvision.com](mailto:support@alliedvision.com).

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