

White Paper

Remote lens control with Prosilica GT cameras



Remote lens iris control with Prosilica GT cameras

Vision applications with fluctuating lighting conditions benefit from cameras with remote iris lens control. Whereas traditional machine vision is most often indoors, outdoor applications are characterized by challenging, unpredictable scene illumination and long cable lengths. Digital interfaces which support long cable lengths and remote control functions brought machine vision cameras to this market.



Prosilica GT auto iris control port

The Prosilica GT GigE Vision camera supports **DC** and **P-iris** (Precise) Auto iris **lens control**. Thanks to the lens control port on the side of the camera, users can control and automate the iris position via the Gigabit Ethernet interface used for image streaming and camera control. Current production firmware (V1.48) is limited to P-iris support, an updated firmware version will include DC Auto iris via field update shortly.

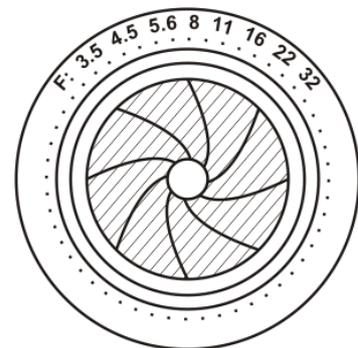
P-Iris lenses: Designed for precise lens control

In contrast to DC lens control, Precise iris (P-iris) lens control is developed for digital cameras, and relies on stepper motors. These motors offer several hundred reproducible positions. The exact number of the positions depends on the respective 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 imager, essential in darker conditions. F16 on the other hand, is the smallest iris opening and limits the amount of light directed at the imager. A smaller iris opening is preferred during bright sunny days to eliminate blooming, smearing or ghosting effects in CCD and CMOS imagers. 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. This enables users to optimize the iris opening during changing lighting conditions.



Iris F16 position

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. Please refer to the figure below. These images demonstrate 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 or Precise iris lens control.



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 which experience iris drift between captures, P-iris will stay in position between triggers.



Kowa P-iris lens

DC auto iris lenses

DC auto iris 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 by a single direction DC motor while a spring returns the lens to its rest state.

Lenses which offer DC Auto iris motorized control are available from a variety of manufacturers, for example:

- Fujinon
- Tamron
- Kowa
- Computar
- Pentax

Analog surveillance to outdoor digital imaging

AVT 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 determines 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. Current production firmware is limited to P-iris support, but will include DC Auto iris via field update shortly.

More information on Prosilica GT cameras

Prosilica GT cameras feature PoE (Power over Ethernet) and the latest CCD sensors by Sony (EXview HAD) and Kodak (KAI quad tap).

Prosilica GT cameras:

<http://www.alliedvisiontec.com/us/products/cameras/gigabit-ethernet/prosilica-gt.html>

Prosilica GT Technical Manual, including lens initialization and step information for P-iris lenses:

<http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gt.html>

Prosilica GT GigE Camera and Driver Attributes. This document contains lens control attribute definitions:

<http://www.alliedvisiontec.com/us/support/downloads/product-literature/prosilica-gt.html>

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