



Technical Details

## 33 Gige Cameras - What's new?



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## 33 GigE Cameras - What's new?

This document describes the new features of the 33G camera series; features already present in 23G cameras are omitted. The features are described as they are exported by the camera itself and as they are visible through any GigEVision driver. The names of GenICamElements are emphasized as GenICamElement.

When using the Device Driver for The Imaging Source GigE Cameras, some of these features might be not accessible, superseded by other features, or used implicitly. HDR cameras avoid this problem by taking multiple exposures of an object (or scene) with varying exposure times. The consolidation of the multi-exposure images leads to the above mentioned color channels with a dynamic range from 10 to 16 bits.



# 33 GigE Cameras - New Trigger Options

## New Trigger Timing Parameters

The 33G camera series offers several new options for dealing with bad trigger signals. By using the Debounce Time, Denoise Time, and Mask Time parameters, the camera can be configured to ignore pulses on its TRIGGER IN line under certain conditions. Useful values for these parameters are application specific. They depend on the expected trigger frequency, the exposure time, and assumptions about the input signal quality. The default values for all these parameters is 0  $\mu$ s, assuming perfect signal quality.

### Trigger Debounce Time

The TriggerDebouncer parameter specifies the time for which the trigger input has to be in a low state in order to accept the next trigger signal.

### Trigger Mask Time

The TriggerMask parameter specifies the time for which trigger pulses are ignored after accepting a trigger signal.

### Trigger Noise Suppression Time

The TriggerDenoise parameter specifies the time for which trigger input has to be in a high state in order to be accepted as a trigger signal.

## New Trigger Exposure Modes - Trigger Width Exposure Time Control

Setting the TriggerSelector to ExposureActive enables the trigger width exposure time control. In this mode, the exposure time is no longer controlled through the ExposureTime parameter. Instead, it is determined by the time the TRIGGER IN pin is kept in a high state.

**Please note:** This option is not supported by all sensor types.



# 33 GigE Cameras - Automatic Gain, Exposure & White Balance Control

## Automatic Gain, Exposure & White Balance Control

The 33G cameras can automatically control gain, exposure time and white balance. These automatic functions are enabled by default.

A region of interest can be specified for the automatic functions, allowing fine-grained control over the image area in which the image parameters are to be optimized. A selection of pre-defined area presets is available, but the user can also specify the coordinates of a custom rectangle.

In certain situations, it is desirable to limit the range of the auto-controlled parameters. For example, one might want to avoid high gain settings in order to keep noise levels low. Other applications require limiting the maximum exposure time, so that movements are not blurred; therefore, the ranges of the gain and exposure parameter can be limited.

If both auto exposure and auto gain are active, the camera tries to lower the gain value in order to reduce noise and improve the image quality.

## Auto Exposure

Auto exposure is enabled by setting the ExposureAuto parameter to Continuous.

### Exposure Auto Limits

The ExposureAutoLowerLimit and ExposureAutoUpperLimit parameters define the lower and upper limit for auto exposure. By default, the lower limit is set to the minimum possible exposure value. If ExposureAutoUpperLimitAuto is enabled, the upper limit is automatically kept at the highest possible value according to the configured AcquisitionFrameRate.

## Auto Gain

Auto exposure is enabled by setting the GainAuto parameter to Continuous.

### Gain Auto Limits

The GainAutoLowerLimit and GainAutoUpperLimit parameters define the lower and upper limit for auto gain. By default, both the lower and upper limit are set to allow the Auto Gain algorithm the use of the entire available gain range.



# 33 GigE Cameras - Automatic Gain, Exposure & White Balance Control

## Auto Reference Brightness

The ExposureAutoReference parameter specifies the target brightness for both auto exposure and auto gain. The default value is 128, which is exactly the middle of the range (0 to 255).

## Auto Highlight Reduction

Enabling ExposureAutoHighlighReduction will allow the Auto Exposure and Gain algorithms to try to reduce over-exposed areas in the output image. This feature is particularly useful when using 10/12/16-bit output images and a tone mapping algorithm in post-processing, as dark areas contain significant detail at these higher bit depths.

## Auto White Balance

33G color cameras feature auto white balance, which is controlled through the BalanceWhiteAuto parameter.

### Gray World

The default auto white balance algorithm is Gray World. It is selected by setting the BalanceWhiteMode accordingly. The Gray World algorithm operates under the assumption that the average color of a scene is near gray, and adjusts the white balance coefficients accordingly. Performance can, however, begin to deteriorate in some extreme situations. An example of this might be when no gray or white is present in the object or scene being imaged (as with a monochromatic surface). In such a case, the image is rendered as gray only.



# 33 GigE Cameras - Automatic Gain, Exposure & White Balance Control

## Color Temperature

To avoid the problems posed by the Gray World algorithm, the Temperature mode can be used. The major advantage of this method is that monochromatic surfaces can be correctly reproduced. This mode is activated by setting `BalanceWhiteMode` accordingly, and operates by determining the color temperature of the light source.

To assist the automatic white balance temperature detection, `BalanceWhiteAutoPreset` can be set to one of the following values:

- Auto Warm White
- Auto Cool White
- Auto Daylight
- Auto Deep Shade

## One-Time White Balance Calibration

To perform one-time white balance calibration, place a reference white sheet in front of the camera, and set `BalanceWhiteAuto` to `Once`. The camera will then find the correct white balance settings for the current light conditions, and keep them active until instructed otherwise.



# 33 GigE Cameras - Region of Interest (ROI) for Auto Controls

## Region of Interest (ROI) for Auto Controls

The `AutoFunctionsROIEnable` parameter enables the ROI mode for all automatic algorithms.

### Region Presets for Auto Controls

By selecting one of the possible values in `AutoFunctionsROIPreSet`, a preset ROI for all automatic algorithms can be activated. The possible values are:

- Full Sensor
- Center 50%
- Center 25%
- Bottom Half
- Top Half
- Custom Rectangle

### Customized ROI for Auto Controls

If `AutoFunctionsROIPreSet` is set to Custom Rectangle, the exact location of the ROI can be configured through the `AutoFunctionsROILeft`, `AutoFunctionsROITop`, `AutoFunctionsROIWidth` and `AutoFunctionsROIHeight` parameters.

The coordinates are relative to the origin of the current video format as specified by `OffsetX` and `OffsetY`.



# 33 GigE Cameras - Action Commands

## Action Commands

Action commands are (typically) broadcasted as GigE Vision control messages, which can be used to issue commands to multiple cameras simultaneously. The 33G camera series can receive trigger signals through action commands.

### Action Command Matching

Both the camera and the action command message contain a set of three parameters that determine whether the device processes a message it received as an action command:

- The ActionDeviceKey parameter is used to authorize the action on the device.
- The ActionGroupKey parameter can be used to define which groups of devices execute an action.
- The ActionGroupMask parameter can be used to further filter devices from their group.

A message is accepted as an action command if all of the following 3 conditions are met:

- The camera's device key is equal to the message's device key.
- The action's group key is equal to the message's group key.
- A logical AND-operation between the action's group mask and the message's group mask results in a non-zero value.



# 33 GigE Cameras - User Property Sets

## User Property Sets

The 33G cameras can store their complete configuration into built-in non-volatile memory. The camera configuration can be saved onto (and restored from) one of two available memory slots. Additionally, the camera can be configured to load one of the user's camera configurations at startup.

### User Set Selector

The UserSetSelector parameter selects the memory slot on which consecutive load and save commands are executed. Its possible values are:

- UserSet1 is the first of the two memory slots for user configurations.
- UserSet2 is the second of the two memory slots for user configurations
- Default is a special memory slot that always contains the camera's factory default configuration. It cannot be overwritten.

### Saving a Property Set

By using the UserSetSave command, the user can save the camera configuration into the memory slot selected by UserSetSelector

### Restoring a Property Set

By using the UserSetLoad command, the user can restore the camera configuration from the memory slot selected by UserSetSelector.

### Startup Behavior

The UserSetDefault parameter selects which memory slot is used for device initialization when the camera is powered up.



# 33 GigE Cameras - Hot Pixel Correction

## Hot Pixel Correction

The 33G cameras perform hot pixel correction on the image data. A list of defective pixels is stored in the device's non-volatile memory.

One can use the Hot Pixel Correction program to update the defective pixel list in case new pixel defects arise in the camera's lifetime.



# 33 GigE Cameras - Image Data Transmission

## Image Data Transmission

The 33G cameras contain large frame buffer memories so that they can reliably transmit images using the GigEVision Packet Resend feature, even if the network is busy. Additionally, 12-bit packed pixel formats reduce the required bandwidth while capturing images with increased bit depths.

### Maximum Packet Size

The maximum packet size for GigEVision image data transmission was increased to 16 KiB. It is generally recommended to use the largest packet size possible; using larger packets means fewer packets per frame, which in turn reduces CPU load on the receiving computer.

The maximum possible packet size is also limited by the network adapter and, possibly, network switches. In practice, this usually results in a maximum packet size of 9014 bytes.

A message is accepted as an action command if all of the following 3 conditions are met:

### 12-bit Packed Pixel Formats

The 33G camera series supports 12-bit packed GigEVision pixel formats. 12-bit formats use 1/4 less bandwidth than their 16-bit counterparts.

Depending on the sensor type, one of the following formats is supported:

- Mono12Packed
- BayerGR12Packed
- BayerGB12Packed
- BayerRG12Packed
- BayerBG12Packed



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