Motion Blur

These settings control the amount, type, and quality of motion blur. Arnold can apply motion blur to cameras, objects, lights, and shaders.

**Motion Blur Noise**

Very long key ranges will produce exaggerated motion blur, but will also cause more noise to appear within the motion blur trail. Increasing the number of Camera (AA) samples is the only way to reduce this noise.

![Motion Blur Noise Example](image)

\[Camera (AA) \text{ samples: 3} \quad \text{Camera (AA) samples: 6}\]

**Ignore Motion**

Ignores all motion keys. This can be found under the list of Feature Overrides in the Diagnostics.
Enable

Enables motion blur.

**Instantaneous Shutter** *(for motion vectors)*

Sets an instantaneous shutter for the camera, so that the beauty and other AOVs are not motion blurred, but you still get motion vectors for the *Motion Vector* shader or the *Motion Vector* AOV.

**Deformation**

This option specifies whether motion blur will take into account geometry deformation. This should only be enabled when objects in the scene change shape quickly enough since this option uses more memory and renders slower. Adding motion blur to hair also requires *Deformation Keys*. It is enabled by default.

Deforming objects such as hair or grass require deformation motion blur

**Camera**
Switch for enabling or disabling camera motion blur (enabled by default).

Shaders

Switch for enabling or disabling motion blur on shader parameters (disabled by default).

Keys

The number of sub-steps used for motion blur can be set in the keys attribute within the Motion Blur settings. For situations where there is a direct movement, such as translation and rotation with constant speed, two keys are enough. However, if the object moves erratically during the exposure interval or performs any other kind of non-linear movement, you will need to increase the number of keys.

Increasing the number of keys does not usually have much effect on rendering times, although it requires more memory to store the additional geometry at multiple times, especially for large polygon meshes.

Below are examples where an increase in the number of keys is required. Notice that increasing the number of keys rounds off the corners of the spinning wheel:

The effect is more apparent when animating a deforming object along a motion path:
Shutter Controls

**Position**

Specifies an Offset for the shutter’s time interval which allows you to change the motion blur trails. The Position offsets the motion blur within the image. It is a relative value that extends towards the frame.

This setting allows you to control when the camera shutter opens and closes relative to the frame being rendered.

**Start on Frame**

The shutter opens at the current frame. For example, rendering frame 5 with a length of 1 would result in the times 5.0, 5.5, 6.0 being calculated.

**Center on Frame**

The shutter is open during the current frame. For example, rendering frame 5 with a length of 1 would result in the times 4.5, 5.0, 5.5 being calculated.
Pool ball positioned in center  Center On Frame

**End on Frame**

Makes the shutter close at the current frame. For example, rendering frame 5 with a length of 1 would result in the times 4.0, 4.5, 5.0 being calculated.

Pool ball positioned in center  End On Frame

**Custom**

Allows you to define the start and end point for the motion range.

Custom Shutter Angles rendered at frame 0

**Length**

Shutter Length: 0. No blur.  Shutter Length: 0.5 (default). 180°.  Shutter Length: 1. 360°.
You can use this attribute to tweak the size and length of the motion blur trails. Normally this won't be bigger than one frame unless you are looking for an exaggerated effect.

- When set to 0, neither geometry nor camera motions are considered.
- Smaller values create a subtler motion blur effect.
- Larger values create a wider or longer motion blur effect, simulating a faster speed.

To get a 180 degrees shutter angle, you should use a length of 0.5 frames (since the exposure time will be 1/48s (assuming you are using 24 fps), which is the equivalent to 0.5 frames).

To get 360 degrees, you should use a length of 1 and to get 90 degrees you would, therefore, use a value of 0.25.

A value of 0 yields no motion blur, while larger values create longer blurred trails, simulating a faster speed. The standard value is 0.5, equivalent to a 180° shutter angle.

The shutter length is equivalent to the exposure time above.

- 45° shutter angle = Shutter length 0.125
- 90° shutter angle = Shutter length 0.25
- 180° shutter angle = Shutter length 0.5
- 360° shutter angle = Shutter length 1
Example of a long shutter Length

The shutter length and characteristic can be further controlled in the Camera.