Principles of Magnification

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Magnification products are an essential element to the daily activities of many individuals today. Whether the application is for commercial, professional or personal use, a magnifier enhances one's ability to perform or enjoy a task or hobby.

Focal Length:

The distance from the center of the lens (or lens system) to the viewed object. Focal length is the distance from the bottom of the lens to the object when the object appears at maximum magnification without distortion. It is important to remember that as magnification increases, the focal length decreases.

Working distance:

Working distance is measured from the lowest protruding portion of the magnifier below the lens, usually the bottom of the shade or shade housing to the object when it appears in focus.

Diopter (d):

A term used to identify the refractive (light bending) capacity of a lens. In magnifiers, there is a direct correlation between focal length and diopter. To find the diopter of a magnification lens, follow these steps: (1) With the eyes 10 inches above the lens, move the object to be viewed to the point the greatest distance below the lens where it remains in sharp focus, (2) Measure the distance and divide this distance into 1 meter (39.37 inches). The result is the diopter of the lens. For example, if the object is at a 13" distance then it is a 3-diopter lens (39.37/13=3d). Each diopter increases the size of the viewed object by 25% when the object is at its full focal length from the lens.

Field of View:

The distance across the lens surface to which the viewer brings both eyes (note: eyes should be 10" above the lens). It is important to note that as magnification increases, meaning the lenses used are stronger, viewing areas and working distances decrease.

Magnification:

The degree to which the viewed object is enlarged. Magnification is usually expressed by a number followed by an "X", the symbol used to express power or the size of the object in relationship to its actual size. The formula for calculating magnification power is:

(Diopter/4)+1=Magnification. E.g. 20D/4+1=6X

Selecting the Right Magnifier:

1. Determine the desired magnification for your needs. Remember, as you increase magnification, you decrease both working distance and the field-of-view.

2. Check to find out the correct diopter you need to achieve that magnification. The vast majority start with the standard 3-diopter factory-installed lens and add secondary lenses or change primary lenses as needed.

3. Note the focal length and lens diameter that correspond to the magnification and lens diopter you have chosen, and make sure they are suitable for your task.

4. Select the primary and secondary lens combination required to achieve the desired magnification.

5. As a general rule, because the working distance will be less than 4 inches, lenses or lens combinations above 4X are recommended for inspection purposes only.

The right light

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