

## IR objective lens

### Introduction

The infrared objective lens is an integral part of the infrared vision system, which is used to collect radiation in the near-infrared, short-wave infrared, mid-wave infrared, or long-wave infrared spectra (Figure 1), and focus the object onto the detector. Information such as temperature distribution and pixel information could be captured and displayed as thermal images. Which is widely used in many industrial inspection applications, its optical system can ensure good imaging quality in a wide operating temperature range, high resolution in a wide field of view.

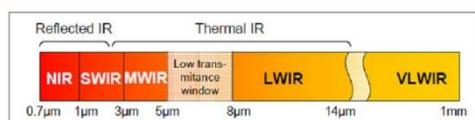


Figure 1. Electro-magnetic Spectrum showing Wavelength Range

### Operation Principle

The imaging principle of the infrared objective lens is to use the objective lens to receive the infrared radiation energy of the measured target, and reflect it on the photosensitive element of the infrared focal plane detector according to the original spatial order distribution. The infrared detector will convert the infrared radiation energy into electrical signals. Amplified, converted or standard video signals are displayed on the display to display infrared thermal images as shown in Figure 2.



Figure 2. Schematic diagram of thermal imaging principle

This thermal image corresponds to the thermal distribution field on the surface of the object. Through software settings, the infrared thermal imager will

automatically demarcate different colors for different temperatures on the thermal image.

Infrared objectives are designed to use optical elements that are special infrared materials such as Germanium (Ge), Zinc selenide (ZnSe), Zinc sulfide (ZnS), and chalcogenide glass. The key of infrared optical systems is to reduce chromatic aberration. In order to have a good imaging quality of the system, the general chromatic aberration correction requires at least three materials with different chromatic aberration coefficients, and the materials have different chromatic dispersion coefficients in order to effectively control the secondary level spectrum, as shown in Figure 3 and Figure 4.

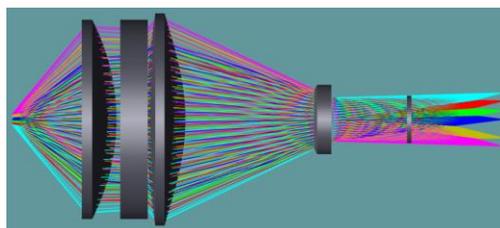


Figure 3. layout of IR Objective lens

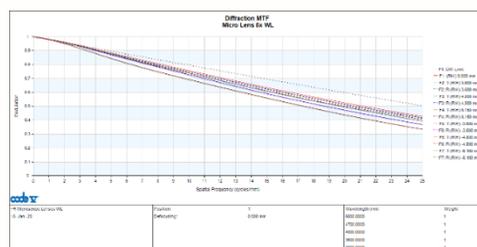


Figure 4. MTF of IR Objective lens

### Applications

Infrared objective lens has optical microscope magnification function and temperature measurement function, which can be applied to non-destructive testing of microelectronic devices, temperature measurement and positioning of tiny objects. It has been widely used in the fields of industrial equipment status detection, medical diagnosis, scientific experimental research, national defence and security.

