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Guide to Spotting Scopes

The majority of terrestrial telescopes are prismatic and as such follow the basic design of a large monocular (half a binocular) usually between 50mm and 100mm in diameter, designed for use with a range of different magnification eyepieces. These prismatic telescopes are often called spottingscopes or fieldscopes.

Telescope specifications Using the example 20x60, the first number '20' represents the magnifying power and brings objects 20x nearer when compared to the naked eye. The second number '60' denotes the diameter in mm of the objective (OG) lens through which light enters the telescope. A 20-60x60 has a 60 mm OG with a zoom eyepiece that enables the magnification to be varied between 20x and 60x. Most telescopes now come in 'body only' format e.g. HR66, ES 80, MM2 52. These models have 66mm, 80mm and 52mm OG lenses respectively, and no built-in eyepiece allowing the choice of eyepiece to be made separately.

What magnification? Terrestrial telescopes are most commonly used to provide high magnification viewing over long distances. Image quality at different magnifications will largely depend on the design of the optical system, the quality of glass used and the coatings applied to the surfaces of each lens. There are however a few general rules that can be applied in determining the right specification for your needs.

Firstly, the relationship between the magnification, OG lens and the size of the eye pupil, and secondly the quality of the optics inside the scope. In normal daylight, when the pupil is dilated to between 2 and 3 mm, a 60 mm telescope will deliver optimum performance, (the balance between magnification and image brightness) at magnifications between 20x - 30x magnification i.e. when the exit pupil diameter equals that of the iris. In twilight when, depending on age the pupil will open to between 7 and 8 mm, the same telescope will deliver optimum performance at between 7.5 and 8.5x. As with binoculars, the higher the magnification, the shorter the depth of field and the narrower the field of view.

Higher magnification also increases image and colour distortion. This effect can be reduced by using ED or Fluorite combination objective lenses that minimise chromatic aberration, enhancing overall contrast and clarity across the magnification range. At magnifications of 20x or lower, the benefits of these expensive lenses are hardly noticeable when compared to conventional glass objectives.

Light Transmission The relative light transmitting capacity of a telescope (Twilight Factor) is found by calculating the square root of the multiplication of the eyepiece magnification with the objective lens diameter. Using this calculation to assess image brightness can be confusing as under these rules a 20x70 combination will give a lower light transmission than a 30x70 combination. The best way to assess the actual brightness of any telescope and eyepiece combination when choosing for daytime terrestrial use, (assuming equal optical systems) is to calculate the exit pupil diameter in the same way as with a binocular and making a trade-off between image brightness and magnification desired. For general daytime terrestrial observations good compromise magnifications are between 20x and 35x.

Field of view As with light transmission FOV is directly related to the magnification. The greater the magnification, the smaller the field of view. Normally expressed as the width in metres of the image when viewing at a distance of 1000m, there are exceptions, namely wide-angle eyepieces designed specifically to provide greater fields of vision. It is important to note that the objective lens, irrespective of diameter has no influence over the field of view.

Resolution As a general rule a good telescope should be able to resolve two black dots 1.5mm distance apart on a white surface, in bright daylight from a distance of 50m.

Eyerelief This is the distance between the eye lens and the point where the pupil is positioned for full field of view and varies from eyepiece to eyepiece. In some cases the eyerelief is shorter than that required by spectacle wearers to obtain the full field of view, especially at higher magnifications. If it is important that you obtain the full field of view with spectacles please refer to any of the following eyepieces: HDF (all models), HR; 40812, 40930, 40931 and 40932, IS; 40916 and 40918. Remember, rubber eyecups although fitted to many eyepieces are no guarantee that the full field of view is obtainable when set in the 'down' position and used with glasses.

Straight-through or 45 degree angled Common advantages of an angled telescope are that: i) the back, shoulders and neck are in a more relaxed position when looking through the scope, ii) the tripod can be set at a lower position making it easier for people of different heights to use and the equipment more stable in outdoor conditions. Straight-through telescopes are easier to use when following fast moving objects, using the instrument from the confined spaces of a hide or vehicle, or when hand-held.

Our advice Compare different models side-by-side at the same magnification if possible. Product reports are often subjective and are no substitute to individual testing. If you are unable to test before you make a purchase, contact us for information and advice on the best model to suit your needs.

Guide provided courtesy of Opticron