WATERPROOFING

Fully waterproof models are sealed with a dry gas inside, usually nitrogen, which reduces misting of the internal lens elements in damp conditions and extremes of temperature. Fully waterproof binoculars are built to withstand submersion in water. (Water resistant and weatherproof models are only designed to withstand light water spray on the body.)
However, please be aware that even a fully waterproof model cannot withstand extreme depth or prolonged submersion as eventually water pressure will break the water seal. Typically a full waterproof will be OK to a depth of 30-60cm for a few minutes, usually long enough to retrieve the binocular.
Note: - Most binoculars will not float; however, you can attach a floatation strap which will hold the binocular just a few cm underwater. A brightly coloured strap will help you to locate the binocular quickly.

COMPASS USE and ACCURACY

Some waterproof binoculars include a built in compass which is a useful navigation aid however there are a few words of caution in their use.

Usually compasses only operate correctly when held flat. This is due to the design of a magnetic compass requiring a damped rotating indicator but can be a little disconcerting when reading an in-view compass which apparently seems to stick when the binocular is pointed up or down. It's just a matter of getting used to its operation – if your subject involves looking up or down; level your binocular while keeping it pointing in the same direction to take your compass reading.

Be aware of **compass errors.** Even the best and most expensive instruments will give false readings in some situations. There are two problems – Magnetic Variation and Deviation.

Variation arises because compasses read the magnetic North Pole of the earth, which is over 600 miles from the true North Pole, this error is compounded because the earth's magnetic field is not uniform. Good navigation charts give compass variances; however, keep your charts up to date because the earth's magnetic field is always changing.

Deviation is the influence of the immediate surroundings on the reading of the compass.
The compass uses magnetism, so metallic objects nearby can seriously affect the reading, as can anything magnetic which includes magnetic field created by flowing electricity. In practice this means that if you try to use the compass in a building or near anything electrical or metal the reading will deviate. It is also worth bearing in mind that there can be differences in the amount of deviation from one design of compass to another.

RANGE FINDING

Military binoculars and marine models often have range finding scales in view. These can be used to find the approximate range if you know the actual size of the subject you are looking at. Navigation charts include the height of lighthouses, and the size of most military targets is already known. The system works equally well with any object if you know its size.

Some binoculars have a built in scale which allows quicker calculation.

The scale is marked in a measure called MIL's

Each numbered marker in the view is 10 mil

The tank in our picture lies between marker 4 on the left and 3 on the right,

7 marker points = 70mil

Tank = 10m wide
Mil measure = 70

Range = 10/70 x1000 = 142m

Whatever unit is used, the size of the subject is the same unit as used for the distance. If metres are used for the size of the subject, range is calculated in metres, if the size is in feet, then the range is in feet too.

Size can be calculated if range is known.
Size = Range x Mil width / 1000

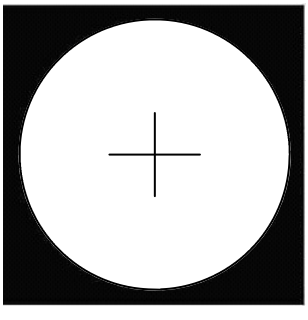
To calculate range, use the formula:-

$$\frac{\text{Target width or size}}{\text{Mil width}} \times 1000 = \text{Range}$$

CROSSHAIRS

Some marine binoculars are fitted with a "cross" marked in the centre instead of the mil scale (or sometimes as well as the mil scale.) The purpose of this is to quickly locate the centre of view to aim the Compass. Removing some of the scale markings from the view leaves a clearer area for viewing.

Often, so the range finder calculation can still be performed, each arm of the cross measures 1 marker point unit (10mil) or 2 marker point units (20mil) across the full width or height of the cross.



1 unit + 1 unit (= 2 units across)

ALWAYS USE BINOCULAR RANGEFINDING and DIRECTION FINDING FOR APPROXIMATE REFERENCE ONLY. NEVER RELY ON THIS AS YOUR ONLY MEANS OF NAVIGATION