

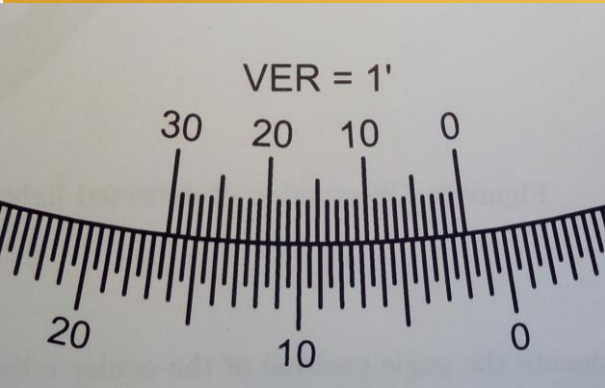
GONIOMETER - SPECTROSCOPE

A **spectroscope** is a device that allows direct observation of the spectra under investigation and measurement of the angular position of individual spectral lines. The main part of the spectroscope is a goniometer consisting of the following elements:

- (a) a **collimator** (1), i.e., a tube with a slit at one end and a collecting lens at the other. The slit, the width of which is adjusted by means of screw 3, is illuminated by a light source (e.g. white or monochromatic light) and must be in the focus of the lens because then the rays come out of the collimator form a parallel beam.
- (b) a **telescope** (2), the objective of which gives an actual image of the slit in the plane of its focal length. This image is the object for the eyepiece of the telescope. The eyepiece (9), through which we look, acts as a magnifying glass, giving an imaginary, magnified image. The telescope is equipped with a so-called spider thread crosshair, which helps determine the telescope's position in relation to the slit image. The position of the telescope can be read using an angle scale with vernier (accuracy of reading $\Delta\varphi = 1'$).
- (c) a **table** (12) on which the optical element to be examined (diffraction grating, prism, etc.) is placed.



1. collimator
2. scope
3. slot width adjustment screw
4. collimator focus adjustment knob
5. fine adjustment knob for table positioning
6. turntable rotation lock screw
7. height and level adjustment lock screw
8. fine adjustment knob for telescope position
9. eyepiece
10. telescope rotation lock screw
11. telescope focus adjustment knob
12. table with level adjustment screws



How to read the position of the telescope:

One angular degree equal to 60 minutes is divided into two intervals of 30 minutes each. The vernier scale has 30 divisions corresponding to 30 angular minutes. In the illustration opposite, the vernier zero is located between 1° and 2° , more precisely in the second part of this interval, which means that the number of minutes is greater than 30. We find the vernier tile that best coincides with the main scale. In our example, it is the 21st division. This means that the angular position of the telescope is equal to $1^\circ 30' + 21' = 1^\circ 51'$

Goniometer adjustment

- a) By sliding the eyepiece (9) in or out of the scope (2), bring the crosshair image from the spider thread into sharp focus. If necessary, unscrew the locking ring and position the spider thread vertically and lock the ring again.
- b) Then point the scope at a distant object and by turning the focus knob (11), find a sharp image of the object.
- c) Point the telescope (2) at the collimator (1). By turning the collimator focus knob (4), find a sharp image of the entrance slit without changing the focus of the telescope. This correct adjustment results in a parallel beam of light between the scope and collimator. Unscrew the locking ring, adjust the slit vertically, and lock the ring again.
- d) The slit width is adjusted using the screw (3).
- e) For the spectrometer to work correctly, the table (12) on which the prism or diffraction grating is placed should be levelled. Level the table by setting your eyes at the height of the table so that you can see the plane of the table as a single line and check that when the table is rotated around its axis, you do not know the plane of the tabletop. If this happens, level the table using the three screws on the underside of the table. Repeat this process several times until the desired result is achieved.