

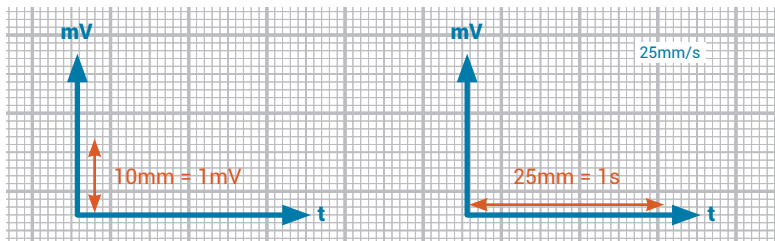
Level 2

Interval (time) and amplitude (voltage) measurements

In this chapter, you will learn about the duration and amplitudes of the various waves and how to measure them.

The ECG grid

You can measure in two dimensions on the ECG paper. The Y-axis shows amplitudes (i.e., voltage), while the X-axis shows time.



Measuring is not always necessary in order to come up with the right diagnosis. Some diseases just require pattern recognition (e.g., acute myocardial infarction), while others require measurements (e.g., ventricular hypertrophy, bundle branch blocks, etc.).

The Y-axis—amplitude measurement

Amplitude or voltage is measured on the Y-axis; 10 mm represents 1 millivolt (mV) with standard calibration. Occasionally, calibration is set at double standard (20 mm = 1 mV) or half standard (5 mm = 1 mV). However, this is only rarely done. So just remember that 10 mm = 1 mV and you'll be fine in 99.9% of cases.

Here's how you can tell if the ECG is adjusted to standard calibration. Almost every ECG printout also has a rectangular calibration signal on it. If the machine is set to standard calibration (10 mm = 1 mV), this calibration signal will be exactly 10 mm high as shown in the example.



The X-axis—time measurement

Most ECG machines print at a speed of 25 mm per second. Therefore, a 25-mm distance on the X-axis corresponds to a duration of 1 second. So remember:

- 25 mm on the X-axis = 1 second
- 5 mm (large box) on X-axis = 1/5 of a second or 0.2 seconds
- 1 mm (small box) on X-axis = 1/5 of 0.2 seconds or 0.04 seconds



Occasionally, paper speed is set at 50 mm/s in which case all ECG intervals are twice as long as normal (large box = 0.1 s instead of 0.2 s, small box = 0.02 s instead of 0.04 s). So whenever all intervals look too long, check for an increase of paper speed to 50 mm/s.

Measuring intervals

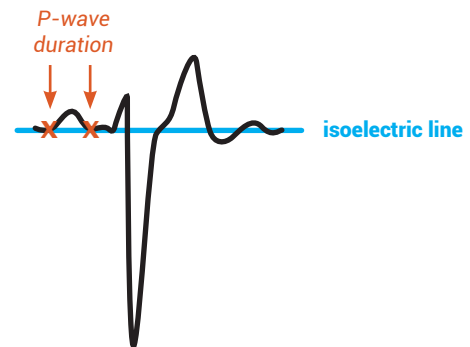
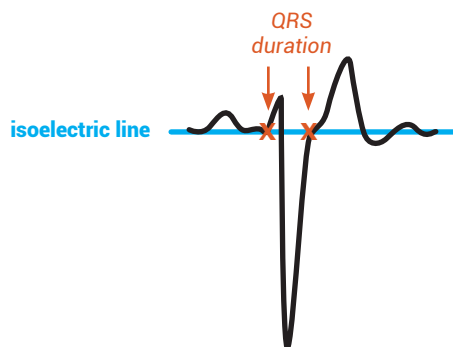
Now it's time to carry out some measurements. The duration of a wave is measured from its initial deviation from the isoelectric line until the point where it returns to the isoelectric line again. The amplitude of the wave is the distance between the isoelectric line and the peak or nadir of that wave.



You should try to evaluate and measure each ECG in a systematic way, one step after the other. In later chapters we will introduce such an approach, which we call the "ECG Cookbook."

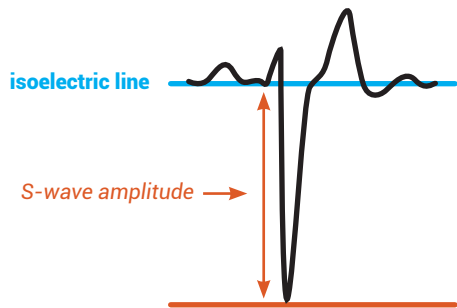
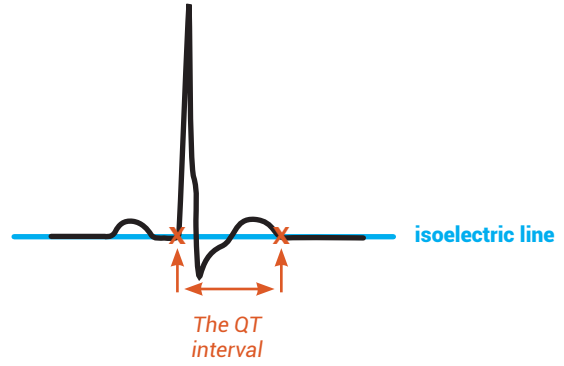
Here is how to measure the different intervals:

Measurement of P-wave duration starts at the point where the P wave leaves the isoelectric line until it returns to the isoelectric line again.



Measurement of QRS duration starts at the point where the QRS complex leaves the isoelectric line until it returns to the isoelectric line again.

Measurement of the QT interval starts at the beginning of the QRS complex until the end of the T wave.



Measurement of amplitudes: start measuring at the isoelectric line until the nadir or peak of the wave.