



Sensitivity Explained.

Definition

The sensitivity of a level is defined as the change of angle or gradient required to move the bubble by a set distance (usually 2mm). If the vial has graduated divisions then the sensitivity refers to the angle or gradient change required to move the bubble by one of these divisions (often spaced at 2mm).

Units

The sensitivity can be defined as an angle or a gradient.

As an angle, the standard units are degrees(°), minutes(') and seconds(""). 1 degree = 60 minutes and 1minute = 60seconds. (1° = 60' and 1' = 60").

Principals

For all spirit levels the sensitivity specification is determined by the sensitivity of the vials that are used. The sensitivity is determined by the radius of curvature of the vials which the bubble moves across. Even though it cannot always be seen, all spirit level vials are curved. The principal of operation is that the bubble will move to the highest point of the radius as gravity acts on the liquid inside the vial. See the picture to the right for a clearer explanation.

Example

If we assume that the bubble in this picture has moved 2mm off centre then we would say that this vial has a sensitivity of 5 degrees per 2mm bubble movement. This can also be expressed as a gradient where 5 degrees corresponds to a gradient of 87mm/m (millimetres per metre). That is to say that if this vial was placed on a 1 metre long beam, and one end was lifted by 87mm, this would create an angle of 5 degrees and would thus move the bubble by 2mm.

Relationship Between Radius and Sensitivity

The sensitivity is directly related to the radius of curvature of the vial; the longer the radius, the more sensitive the vial will be; the shorter the radius, the coarser the vial will be. We manufacture vials with radiuses from 30mm to 100 metres to suit a wide range of applications. On the right is a table showing the relationship between the radius of the vial and it's sensitivity. In this table we have represented degrees in decimal, and in degrees, minutes and seconds. Use the boxes at the bottom of the table to put in your own figures for conversion.

Deciding Which Sensitivity

In order to determine which sensitivity is best for a particular application, it is first necessary to decide how level the product needs to be. Another way of looking at this is to consider what is the maximum angle off-level that the product will still work correctly.

Let's say for this example that the product needs to be level within 0.1° (6'). The next assumption we need to make is how accurately the user can centre the bubble between the divisions on the vial. We would normally assume that this is possible to within 0.5mm although in some applications it may be more or less than this. Based on these figures, we need a vial that will give at least 0.5mm bubble movement for a 0.1° (6') change in angle. This corresponds to 0.4° (24') for a 2mm bubble movement, so we would say that we need a vial with a sensitivity of 24minutes per 2mm bubble movement.

