

How to Measure Gloss using the Elcometer 480 Glossmeter

When it comes to the visual appearance of any object, gloss is a vital aspect to measure.

The perception of gloss can relate to a product's finish, texture, and how a sample is illuminated and viewed.

Surfaces with high reflectance are perceived as glossy, shiny or lustrous, whilst less reflective surfaces are perceived as semi-gloss or matt.

Manufacturers of different products will typically specify the need for different levels of gloss, depending on the product. Manufacturers of cars or magazines, for example, typically aim for a higher gloss finish than companies coating military or naval vehicles. After all, you don't want the sun's reflection to give away your position, when you have designed very expensive anti-radar coatings.

Nevertheless, in many instances a high gloss finish implies high quality, and it's important to ensure that the level of gloss not only remains consistent across the product, but also across manufacturing batches; otherwise customers may, on the one hand, see this as a defect or an indication of poor quality; or in the case of road signs or military vehicles, it can negatively affect their performance.

As gloss is essentially determined by establishing precisely how reflective a surface is to light, how do we objectively measure it?

Typically, using an optical instrument called a glossmeter, which provides the user with quantifiable gloss measurements, expressed in gloss units, or 'G'U's.

The gloss measurement range is from 0-2000GU, where 0GU is a perfect matt finish that reflects absolutely no light, and 2000GU is perfect mirror that reflects all of the light.

Whilst the naked eye is perfectly capable of identifying variations in gloss, it is not a sufficient way to evaluate the appearance, as it can come down to the opinion of one inspector over another. Furthermore, the way gloss is perceived by individuals can differ on their personal experiences – what is too glossy for a manufacturer of a naval ship for example, may be too dull for the manufacturer of a luxury yacht.

Without a glossmeter the human eye can detect certain differences in gloss, depending on the gloss level of the sample. It's been estimated, for example, that when comparing samples of a low gloss surface of around 5GU, the human eye can detect about a ± 3 GU difference in the surface. On a higher gloss surface of say 60GU and above however, any changes in gloss are extremely hard to detect.

Glossmeters measure gloss by directing light at a fixed angle (known as the angle of incidence), onto the test surface. The glossmeter measures the amount of light that gets reflected off the surface through a photo detector, which is positioned at the same angle opposite to the light source. Typically, the more light that's reflected, the glossier the surface is, as high gloss surfaces reflect light distinctively. Semi-gloss and matt surfaces, on the other hand, diffuse the light, scattering it in all directions. The more uniformly the light is scattered, the less intense the reflection of light onto the photo detector, resulting in a lower gloss reading.

The measurement angle, or angle of incidence, can also affect the amount of light reflected. This is because the perception of gloss can vary widely between different viewing angles. For example, matt surfaces can still appear glossy under typical room lighting when viewed from a low angle. So

to ensure you take gloss measurements that best represent the visual appearance of the surface, several measurement angles are used. These angles have been defined by National & International Standards bodies, and the various Test Methods. These angles are typically 20°, 60°, and 85°; and for some industries 45° and 75° are also used.

So how do you choose the correct angle for gloss measurement?

As we have already discussed, gloss is categorised as one of three things: matt or low gloss, semi-gloss, or high gloss. To determine the most appropriate measurement angle, typically you start with the glossmeter set at 60°. You take a measurement, and if the result is between 10-70GU, the surface is identified as being semi-gloss and should be measured with the 60° measurement angle. If the result is less than 10GU, the product has a low gloss, or is classed as matt, and should be measured using the 85° measurement angle - as this improves the resolution of low gloss measurements. Alternatively, if it's greater than 70GU, the product is classified as high gloss, and should be measured using the 20° measurement angle - which provides a greater resolution for high gloss surfaces.

While these angles suit the majority of the market, in the ceramic and film producing industries, for example, a 45° angle glossmeter is used as it is ideal for semi-gloss measurements. In the paper and vinyl producing industries, where the results are typically low gloss, an angle of 75° is typically specified.

Whilst there are single angle gauges to meet the specialised 45° or 75° angles; in order to meet the majority of the market, glossmeters are typically supplied having either a single 60° measurement angle, dual 20° and 60° measurement angles, or triple 20°, 60° and 85° measurement angles - can be supplied with or without statistics or memory to store readings; data output via USB or Bluetooth to export those readings into a spreadsheet; or into data management software, such as ElcoMaster® for example – which allows you to generate professional inspection reports, instantly. And that's only just the beginning.

To find out more about Elcometer's range of glossmeters simply visit Elcometer.com, or click on one of the links on-screen to watch another video in the Gloss and Reflectance series.

And please, don't forget to subscribe to the Elcometer Channel, to be notified of any new videos.