

# Overall Harmony of Consumer Electronics

**Design knows no limits. This is also reflected in the world of consumer electronics such as notebooks, printers, mp3-players, phones, cameras or home appliances in general. For example, as smartphones have become our permanent companions their look including design and color is most important and follows current fashion trends! Depending on the preferences of a specific target group manufacturers offer a variety of colors with glossy or matte surface finishes which need to be controlled.**

What most consumer electronics have in common is that they are so called multi-component products. Uniform color and gloss of all parts will create a valuable look and is perceived as a high-quality product. In order to guarantee consistent quality a routine QC management system needs to be established among the complete supply chain.

## **Color and gloss instruments with excellent precision for toughest QC requirements**

A variety of materials, from plastic to metal to screen printed glass, are used for consumer electronics and need to be harmonized. Therefore, color and appearance has to be controlled in the daily production process according to



“customer relevant” tolerances. Neutral colors only tolerate very small color deviations and require very tight tolerances. High chromatic colors will accept larger tolerances, but are dependent on its hue. Only testing instruments with excellent precision like the spectro-guide or BYK-mac i will be able to objectively control any color.

## **Color measurement of solid colors**

As an example, the majority of vacuum cleaners are produced in high chromatic solid colors. The overall appearance is influenced by color and gloss. In order to ensure uniform quality, both attributes need to be controlled. The spectro-guide spectrophotometer is the ideal solution for this task, as it measures color and gloss simultaneously. Thus, the cause of a mismatch can be clearly identified.

Small parts like keyboards buttons or smartphone switches require a color instrument with a very small aperture and a repeatable sample placement. The color-guide with a 4 mm aperture together with the optional sample holder guarantees repeatable results and a convenient sample placement.

## BYK-Gardner Solution



**Solid Color & Gloss**  
spectro-guide, 11 mm



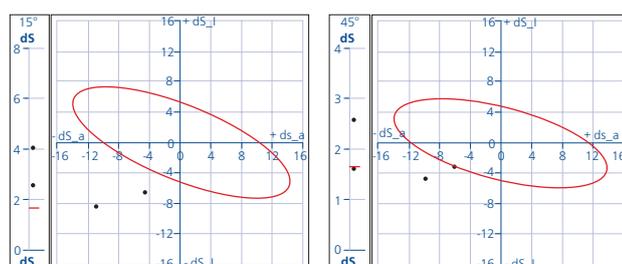
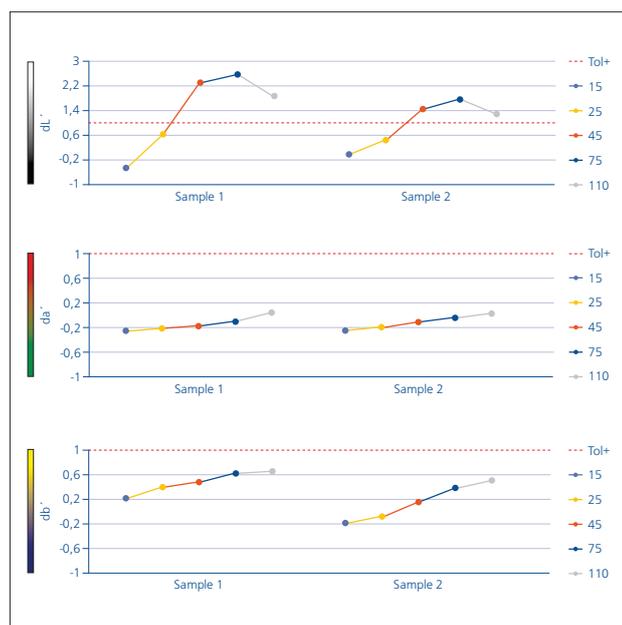
**Solid Color**  
color-guide, 4 mm



**Sample Holder**  
Small Parts 4 mm

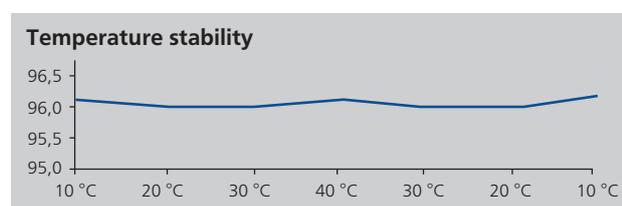
### Color measurement of effect colors

In contrast to solid colors, products with effect finishes change their appearance with viewing angle and lighting conditions. This is a special challenge on parts with very tight fits. For example on notebooks, the track pad and the surrounding housing should have the same color and appearance even though both parts are made of completely different materials. In the following graph color and effect data (sparkle and graininess) obtained from BYK-mac i help to analyze a potential cause of a total color mismatch. Lightness as well as sparkle considerably vary between the reference and the two samples. For small parts the BYK-mac i with a 12 mm aperture can be used together with a specially designed sample holder.



### Measurement of gloss

The control of gloss on all parts of consumer electronics is as important as the color matching. If one component has a different gloss level than the rest, the consumer will immediately recognize it as different and associate it with "inferior quality". Gloss is highly dependent of the mold condition and variation of process parameters such as mold temperature, injection rate or material variations. Therefore, especially high volume products require routine gloss check. Depending on the product specifications the accepted gloss variations can be as small as +/- 0.5 gloss units. Objective measurement results that are repeatable and temperature independent are most important in harsh mass production processes. The micro-gloss has been the unsurpassed industry standard guaranteeing accurate and reliable readings under any circumstances.



### Lightfastness and UV stability tests

Consumer electronic products are exposed to varying lighting conditions every day. To ensure aesthetic endurance, it is of high importance that the materials are lightfast. Hence, accelerated weathering tests are performed, which simulate the effects produced by exposure to daylight filtered through window glass. Specimens are exposed to a xenon-arc light source for a defined number of hours and specified conditions. The extend of degradation varies depending upon the properties of the raw materials. The spectro-guide spectrophotometer is the ideal solution to quantitatively measure color fastness using  $\Delta L^*$ ,  $\Delta a^*$ ,  $\Delta b^*$  for achromatic colors or using  $\Delta L^*$ ,  $\Delta C^*$ ,  $\Delta H^*$  for chromatic colors.



**Multi-Angle Color & Effect**  
BYK-mac i 12 mm



**Sample Holder**  
BYK-mac i 12 mm



**Gloss**  
micro-gloss