Measuring the Gloss of Curved Surfaces

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Accurate gloss measurement is critical for assessing the aesthetic appeal and surface functionality of many products in industries such as automotive, consumer electronics, cosmetics, and medical devices.

Traditional glossmeters can be used to measure flat parts but their optical design and form factor make them completely incompatible with curved surfaces.

For curved parts and small areas specialised instruments with a small 2mm measurement beam are required.

Rhopoint Instruments has long been a leader in gloss measurement technology for curved surfaces. One of the company's hallmark instruments, the **Novo-Curve**, was developed in collaboration with the **National Physical Laboratory (NPL)** and was first introduced in 1995.

3rd generation Rhopoint Novo-Curve measuring pharmaceuticals

The Novo-Curve, now in its fourth generation, was the first commercial gloss meter capable of measuring curved surfaces using a **2mm beam**, setting a benchmark for this type of measurement.

The new Rhopoint Aesthetix® is the most advanced instrument for measuring curved surface appearance.

The new **Rhopoint Aesthetix®** builds on this heritage with a cutting-edge solution for curved surface measurement. Using camera technology, it provides live positioning feedback and, for the first time, measures Gloss, Haze and DOI on small parts—key metrics for high-gloss appearance control.

The optional Novo-Curve adaptor enables Gloss, Haze and DOI measurement of small items like pills, chromed fixings, and candy

Measuring at the universal 60° angle the Aesthetix® fully complies with **ISO 2813** and **ASTM D523** the globally recognized standards for measuring gloss. The instrument is supplied with an **ISO 17025 calibration certification,** ensuring its measurements meet the highest levels of traceability.

The Rhopoint Aesthetix® features user **swappable adaptors**, which reduce the gloss measurement beam from **9mm to 2mm**, making it possible to accurately measure both flat and curved surfaces.

Standard Adaptor, identical measurement to a conventional glossmeter

Curved surface and small part adaptor, included with the Aesthetix

Standard Aesthetix adaptor

Custom adaptors can be designed for perfect part positioning

60 [GU] Std 9mm Aperture	60 [GU] 2mm Aperture
102.2	102.2
94.2	94.1
92.2	92.3
86.7	87.3
50.8	52.0
33.8	35.4
13.1	14.2
9.2	10.1
7.2	7.9
5.8	6.3
4.0	4.3
1.8	2.0
913.2	972.6

Comparison of standard and 2mm aperture measurements using Aesthetix

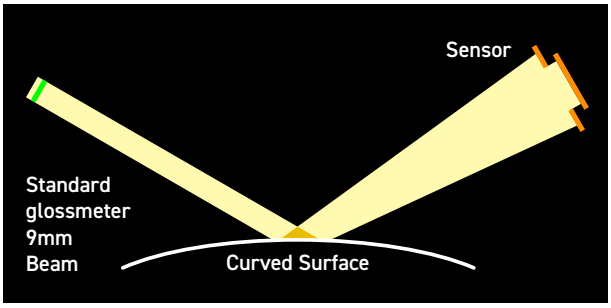
Aesthetix® measurements with the standard and small aperture correlate perfectly giving consistent results on curved and flat surfaces.

Challenges in Gloss Measurement of Curved Surfaces

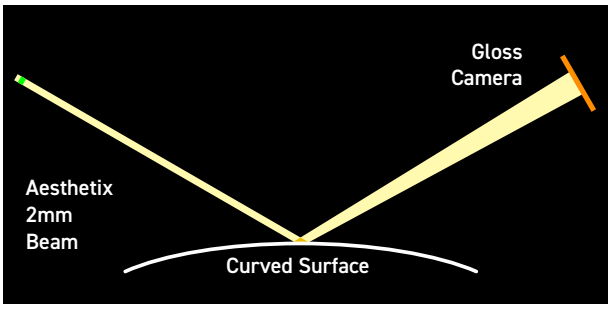
Curved Surfaces

Convex surfaces change the size and shape of a reflected glossmeter measurement beam, making accurate measurement impossible with a standard glossmeter.

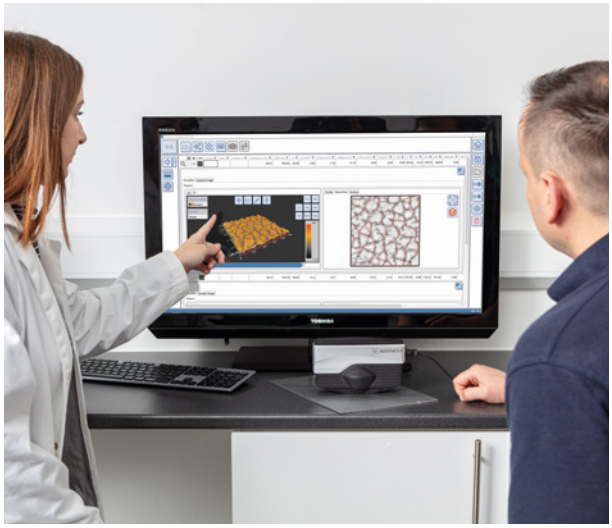
The Rhopoint Aesthetix®, with its small beam and self-correcting imaging system overcomes this challenge, providing consistent and reliable results.



Curved surfaces distort a standard size glossmeter beam, making accurate gloss measurement impossible.



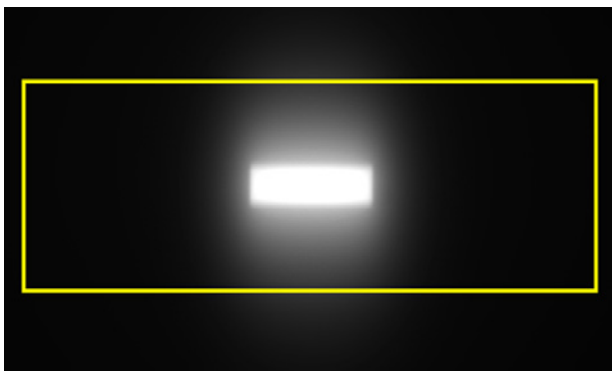
Aesthetix measurements made with the standard and small adaptor correlate perfectly.



Positioning Challenges

The new Rhopoint Aesthetix® enhances gloss measurement accuracy on curved parts by addressing the challenge of precise sample positioning. Traditional instruments like the Rhopoint Flex 60 and Novo-Curve rely on skilled operators or bespoke jigs for positioning but lack feedback on alignment accuracy. The Aesthetix® overcomes this limitation with live alignment feedback.

A real-time feed from the gloss sensor ensures the measurement beam is perfectly centered, enabling adjustments to part orientation or jig modifications. This results in optimal alignment, precise measurements, and highly repeatable results.



The Aesthetix® displays a live gloss reflection image, enabling precise positioning. Aligning the reflection at the sensor's center ensures accurate gloss measurement, even on curved surfaces.

This feedback allows part orientation to be adjusted, or jigs can be modified to achieve perfect alignment.

Integration with COBOT Systems and Non-Contact Measurement

When paired with a **Collaborative Robot (COBOT)**, the Rhopoint Aesthetix® offers even more precise control over measurement positioning.

This setup allows for **fine sensor adjustments** during measurements of highly complex parts, such as **orthopaedic knee implants**, which were previously considered too complex to measure accurately.

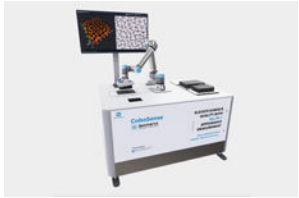
Additionally the Rhopoint Aesthetix®, in conjunction with a COBOT or laboratory measurement stand can take **non-contact measurements**. This feature makes it ideal for delicate parts that are prone to scratching, such as medical implants and high-end finishes on consumer products.

Industrial Applications of the Rhopoint Aesthetix®

The versatility of the Rhopoint Aesthetix®, combined with **custom 3D jigs and COBOT technology i**s ideal for a variety of industrial applications:

- **Automotive:** Full characterisation (gloss haze and DOI) of high gloss paint finishes and chrome parts ensures consistency across production batches.
- **Medical Devices:** Non-contact measurement on orthopaedic implants maintains surface integrity and aesthetic quality.
- **Consumer Electronics:** Accurate gloss, haze and DOI measurements on mobile phones, tablets, and switches ensure premium finishes.
- **Cosmetics:** Lipsticks, tube and other shaped packaging benefit from precise appearance control to maintain their visual appeal.
- **Tooling and Manufacturing:** Gloss of drill bits and other tools is measured to ensure consistent surface finishes.
- **Pharmaceuticals and Confectionery:** Accurate Gloss, haze and DOI measurement of small and irregular shapes to fully describe surface finish.

The flexibility of the Aesthetix measurement adaptors allows for repeatable measurement of diverse applications.



In addition to its curved surface gloss capabilities, the Rhopoint Aesthetix® offers a range of advanced modules for comprehensive surface analysis.

These include:

- **Surface Brilliance** which evaluates the gloss, clarity and reflection qualities of a surface.
- **Texture** measurement which assesses surface smoothness and texture.
- The **Effect Finish** module provides insights into the appearance of special effect pigments.

Together, these modules offer a complete solution for analysing surface appearance, ensuring consistent visual quality across a wide range of materials and products.

Conclusion

The Rhopoint Aesthetix® represents a major advancement in gloss measurement technology for small, curved, and complex surfaces.

It's integration with COBOTs and non-contact measurement capabilities further extend its utility in industries where surface quality is paramount.

The Rhopoint Aesthetix® sets a new standard for gloss measurement, ensuring consistent, high-quality finishes across a wide range of applications.

Novo Curve compatible results but with the addition of positioning feedback, measurement of haze, DOI to fully describe a high gloss surface.

References: *Ged, G. et al. (2023). Effect of Surface Curvature on Specular Gloss Evaluations. [CIE 2023 Presentation]. Beuckels, S. et al. (2022). Development of an Image-Based Measurement Instrument for Gloss Characterization. Journal of Coating Technology and Research, 19(6), 1567-1582. NPL (1995). Measuring the Gloss of Curved Surfaces. NPL Report, National Physical Laboratory.*

Rhopoint Instruments Ltd, Rhopoint House, Enviro 21 Park, Queensway Avenue South, St Leonards on Sea, TN38 9AG, UK
Rhopoint Americas Inc. 1000 John R Road, Suite 209, Troy, MI 48083, USA
Rhopoint Instruments GmbH, Seebauer Office Center, Am Weiglfeld 28, 83629 Weyarn, Deutschland

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