

Understanding Gloss with the Rhopoint IQ-S

The Rhopoint IQ-S is a specially designed instrument built specifically to match automotive interior gloss measurement standards.



RHOPOINT



Why buy an IQ-S, not a gloss meter?

A high quality finish is important in a huge number of industries. "High gloss, deep finish, smooth and homogenous." Orange peel and haze have a huge impact on finish quality. Potential causes - coating formulation, substrate, application technique & conditions, drying/curing. A gloss meter cannot measure these effects that reduce visual quality. **Rhopoint IQ-S - the ultimate gloss meter upgrade.**

What differentiates an IQ-S and an IQ?

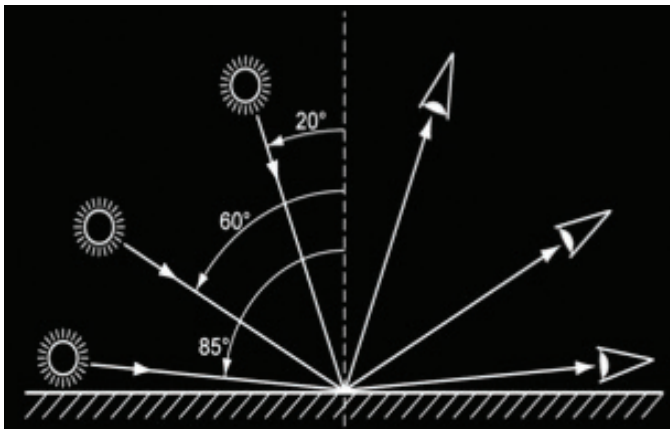
IQ-S type unit is specifically suited for low gloss measurement at 60°, improved accuracy for measurement of low gloss samples (< 10 gloss units) and can be used for materials such as paint, plastic, leather, automotive Interior trim. A reference to the fact that 60° gloss meters typically should not be used under 10 GU due to the non-linear response and that IQ-S overcomes this problem through more accurate calibration over this range.

Who needs these extra measurements?

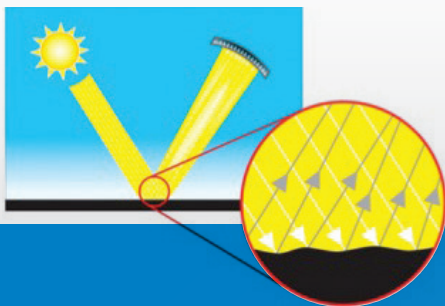
Proven applications in:

- Paints & coatings
- Powder coatings
- Additives
- Inks
- Yacht manufacturer
- Plastics
- Wood coatings
- Automotive
- Aerospace
- Polished stone and metals
- Glass manufacturer
- Consumer electronics
- Anodised metals

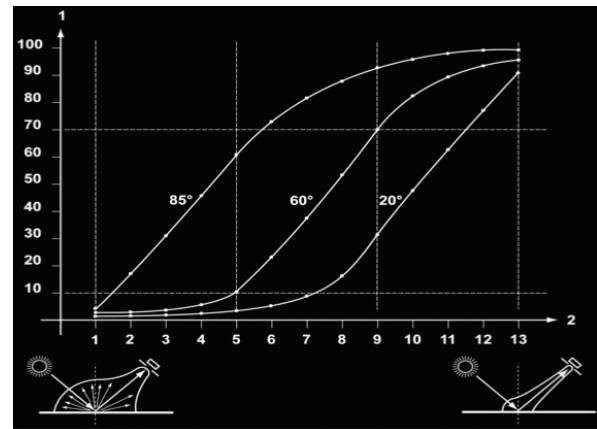
Gloss



The Rhopoint IQ-S has standard gloss meter optics @ 60° & 85° and a high definition 512 element LDA @ 20° +/- 7.25°.



Which angle is best for my application?



Surfaces with gloss < 10GU @ 60° should be measured with the 85° geometry.
Samples where gloss is > 70GU @ 60° measure with the 20° angle.

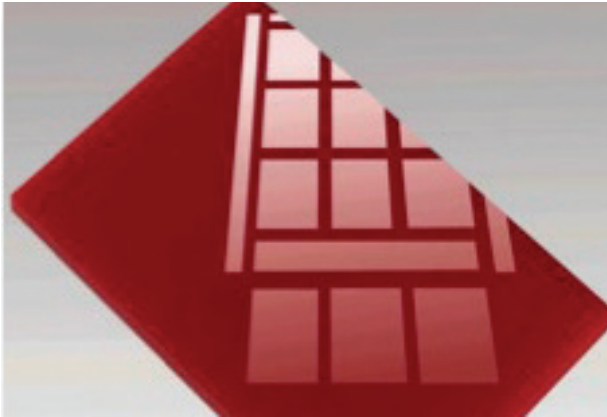
Haze

Haze is light that has been reflected by small surface structures adjacent to the main specular component.

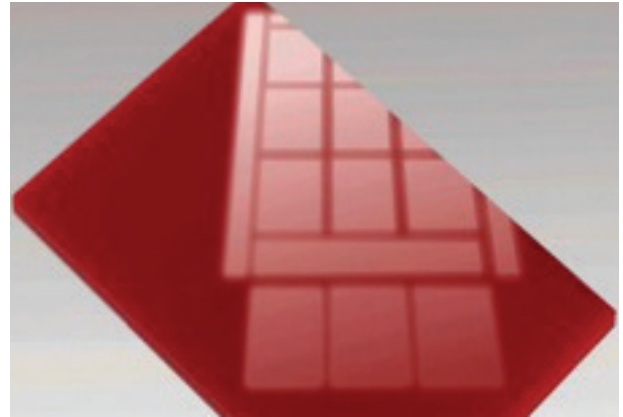
$$\text{Haze } \alpha = \frac{\text{Haze reflectance}}{\text{Incident}}$$

Reflection Haze

Reflection haze is an optical phenomenon usually associated with high gloss surfaces, it is a common surface fault that reduces appearance quality. It is characterised by a surface in which reflections are visibly shallower with a milky finish, in addition halos are often visible around reflections of strong light sources.

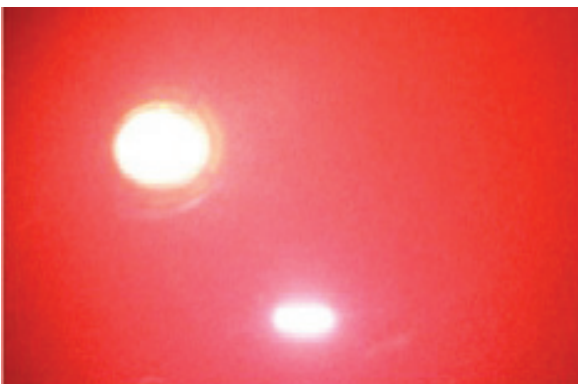


Sample 1- No Haze, deep reflection

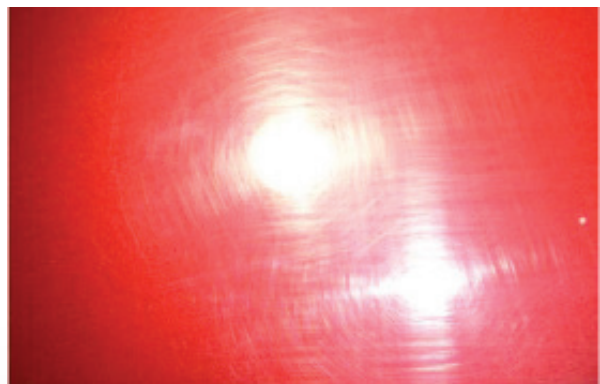


Sample 2- High Haze, 'shallow' finish

A high gloss finish with haze exhibits a milky finish with low reflective contrast- reflected highlights and lowlights are less pronounced.



Sample 3- Low Haze



Sample 4- Higher Haze

On surfaces with haze, halos are visible around the reflections of strong light sources.

CAUSES OF REFLECTION HAZE

Haze can be described as near specular reflection. It is caused by a microscopic surface structure which slightly changes the direction of a reflected light causing a bloom adjacent to the specular (gloss) angle. The surface has less reflective contrast and a shallow milky effect. In the coatings industry, this microscopic surface texture is often due to poorly dispersed raw materials, incompatible raw materials or oxidation and weathering.

For polished metal surfaces haze is often associated with polishing marks or chemical residue.

CAUSES OF HAZE

Coating & Raw Materials

- Dispersion
- Pigment properties
- Particle size
- Binder compatibility
- Influence and migration of additives
- Resin types and quality

Curing

- Drying conditions
- Cure temperature

Post Coating

- Drying conditions
- Cure temperature
- Polishing marks
- Cleanliness
- Ageing and oxidation



Haze- Often visible as milky finish on high gloss surfaces

GLOSS & HAZE MEASUREMENT WITH IQ-S ARRAY TECHNOLOGY

The Rhopoint IQ-S uses a 512 element linear diode array which profiles reflected light in a large arc from 14 to 27°. The IQ-S instrument processes this high resolution data, selecting individual elements within the array that equate to the angular tolerances outlined in international measurement standards. In a single 20° measurement, the following calculations are made by:

$$\text{GLOSS} = \frac{\sum \text{Pixels between } 20^\circ \pm 0.9^\circ \text{ (sample)}}{\sum \text{Pixels between } 20^\circ \pm 0.9^\circ \text{ (standard)}}$$

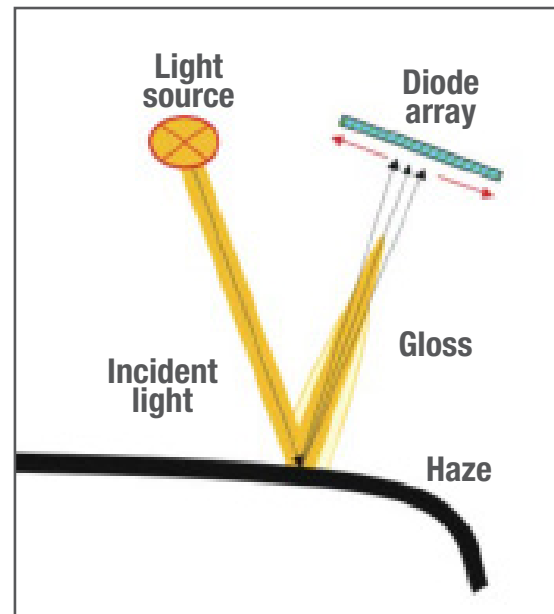
$$\text{HAZE} = 100 * \frac{\sum \text{Pixels from } 17^\circ \text{ to } 19^\circ \text{ (sample)} + \sum \text{Pixels from } 21^\circ \text{ to } 23^\circ \text{ (sample)}}{\text{Specular Gloss (Standard)}}$$

$$\text{LOGHAZE} = 1285(\log_{10}((\text{Haze}/20)+1))$$

AUTO ADJUSTMENT ON CURVED SURFACES

A major advantage of the IQ-S is that it automatically compensates for curved or textured sample surfaces by virtually adjusting the measurement position. Conventional gloss-hazemeters have fixed optics which can make measurement unreliable as any sample curvature will reflect light away from the center of the measurement sensor causing errors.

The IQ-S automatically adjusts the sensor position by detecting the peak of the reflected light. The laws of reflection state that the incident angle is equal to the reflection angle thus the peak equates exactly to the 20° gloss angle.

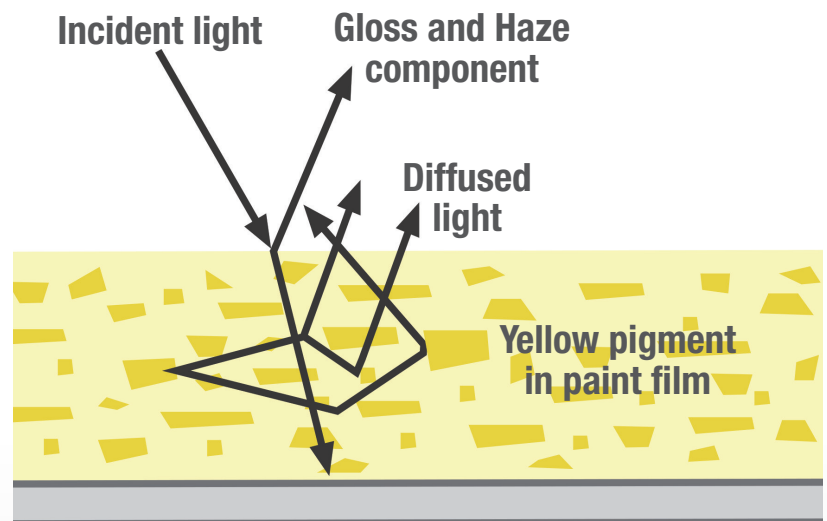


The IQ-S automatically adjusts for non-flat surfaces by sensing the reflected peak and virtually adjusting the position of the sensor.

DIFFUSE CORRECTED HAZE MEASUREMENT WITH IQ-S ARRAY TECHNOLOGY

Reflection haze is caused by micro texture on a surface which causes a small amount of light to be reflected adjacent to the gloss angle. For white surfaces, bright colors and metallics, a certain amount of diffuse light, reflected from within the material, is also present in this region.

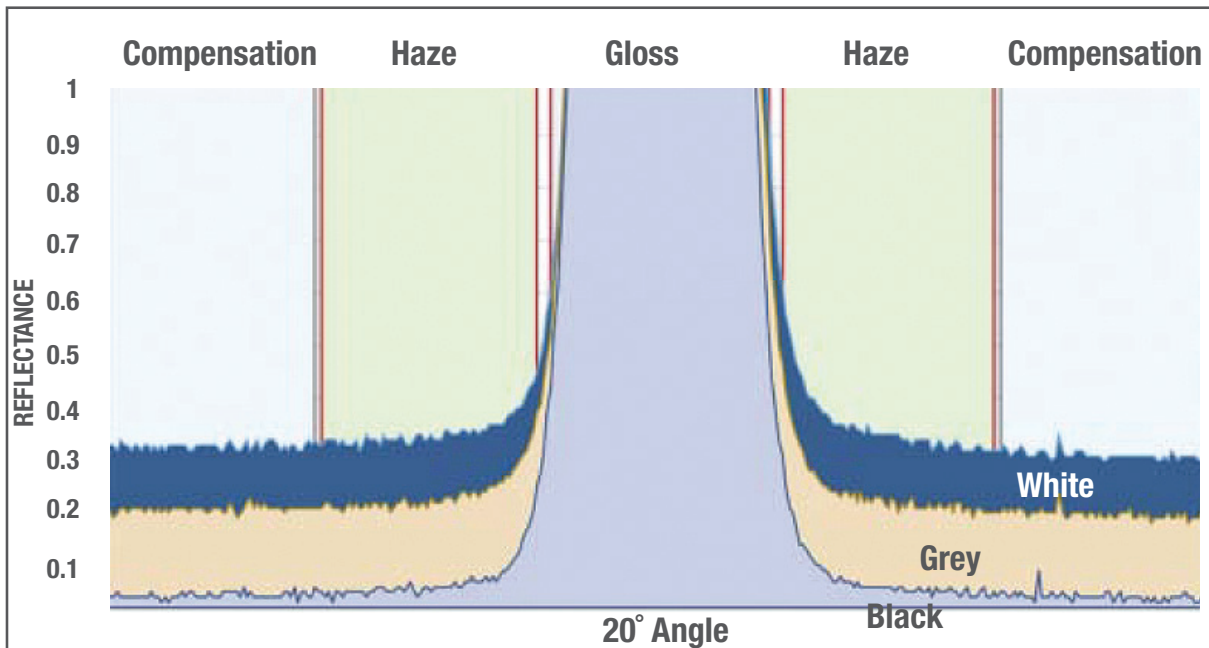
This diffuse light exaggerates the haze signal for these surfaces causing higher than expected readings.



The Rhopoint IQ-S compensates for reflection from within the coating for highly reflective pigments, metallic coatings and speciality pigments, allowing the haze of any painted surface to be measured.

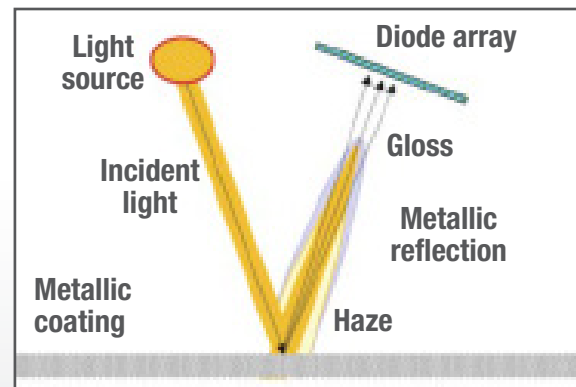
CORRECTED HAZE MEASUREMENT ON METALLIC COATINGS

For non metallic surfaces, the diffuse component is Lambertian: it is equal in amplitude at all angles in relation to the sample surface. Conventional gloss-hazemeters measure diffuse reflection using a luminosity sensor positioned away from the gloss angle. Luminosity is subtracted from the haze signal allowing non metallic surfaces to be measured independent of their color.



IQ-S goniophotometric information profiling the reflection from white, grey and black panels with an identical topcoat.

An advantage of the IQ-S is that unlike a conventional instrument, compensation is calculated using a region adjacent to the haze angle. This technique gives compatible readings on solid colors but also compensates for directional reflection from metallic coatings and speciality pigments.



The Rhopoint IQ-S captures compensation information from a region adjacent to the haze measurement angle. This means it can be used on metallic coatings which reflect light directionally.

ORANGE PEEL

Orange peel is a surface texture which resembles the skin of an orange.



CAUSES OF ORANGE PEEL

Application

- Improper gun adjustment and technique
- Over-spray/dry spray
- Brush marks
- Improper flash or recoat time
- Substrate roughness/waviness
- Sag on vertical surfaces

Coating

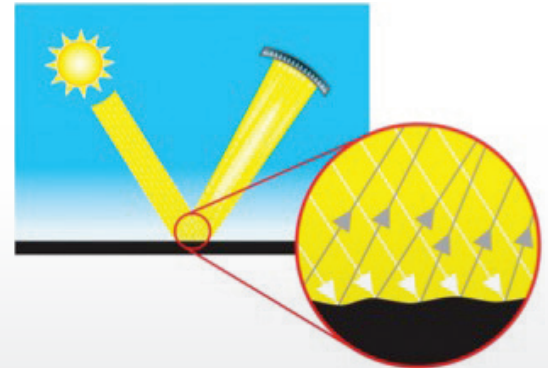
- Incorrect coating, primer or clear coat film thickness
- Poor particle size distribution
- Incorrect viscosity leading to poor flow
- Flake alignment
- Resin types and quality
- Surface energy incompatibility
- Incorrect curing/environmental conditions

DISTINCTNESS OF IMAGE- DOI

Distinctness of image is the aspect of gloss characterized by the sharpness of images of objects produced by reflection at a surface.

$$\text{Haze } \alpha \frac{\Delta \text{ Reflectance}}{\Delta \text{ Angle}}$$

Low DOI is caused by large surface structures distorting the reflected light. The surface is visible: orange peel.

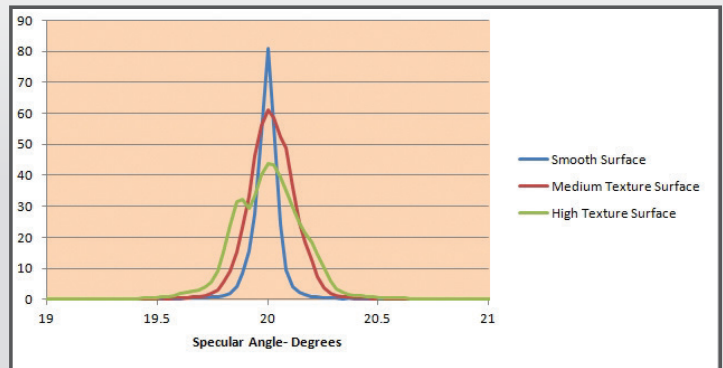


THE RHOPOINT IQ-S MEASURES ALL ASPECTS OF REFLECTIVE APPEARANCE.

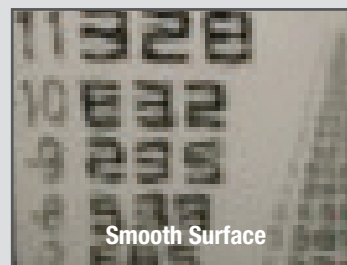
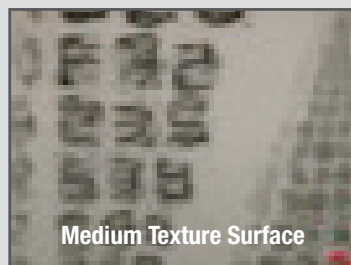
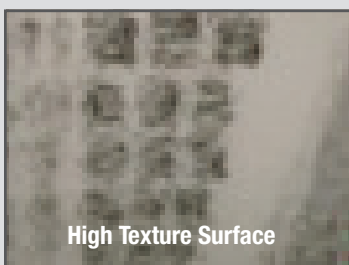
Three high gloss coated panels measure identically using a standard gloss meter, but orange peel dramatically reduces the perceived quality of the surfaces with texture.

Gloss readings @ 20° approximately 85GU
Gloss readings @ 60° approximately 93GU

Only by using additional parameters of DOI/RIQ can the visual quality be measured.

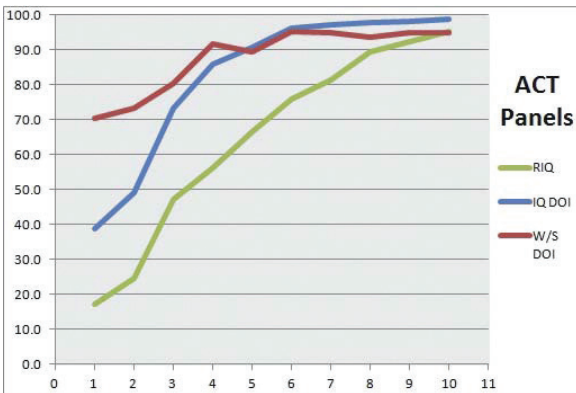


Goniophotometric curves clearly show the visual differences between the 3 panels.



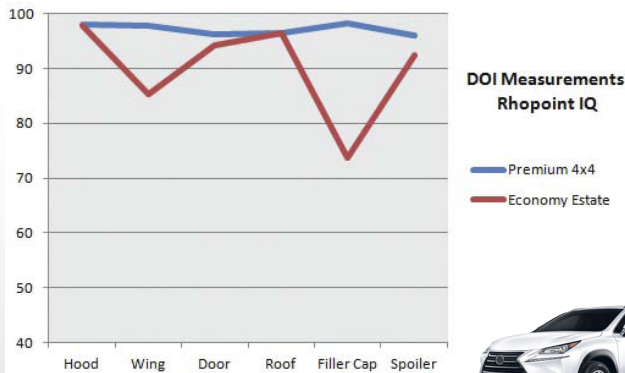
RIQ- REFLECTED IMAGE QUALITY

RIQ is a more sensitive, updated version of DOI.
A new high sensitivity/high resolution sensor allows improved measurement.



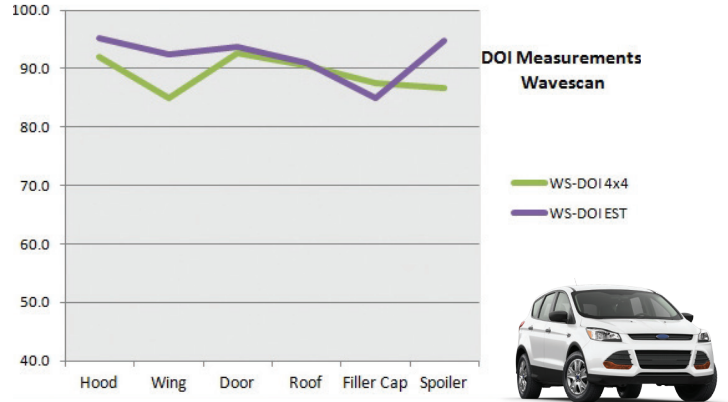
RIQ vs DOI

DOI is not sensitive to low amounts of orange peel on highest quality surfaces.
RIQ has a more proportionate response to orange peel on a wider range of surface finishes.
RIQ works well in differentiating low gloss surfaces with different specular/diffuse components.



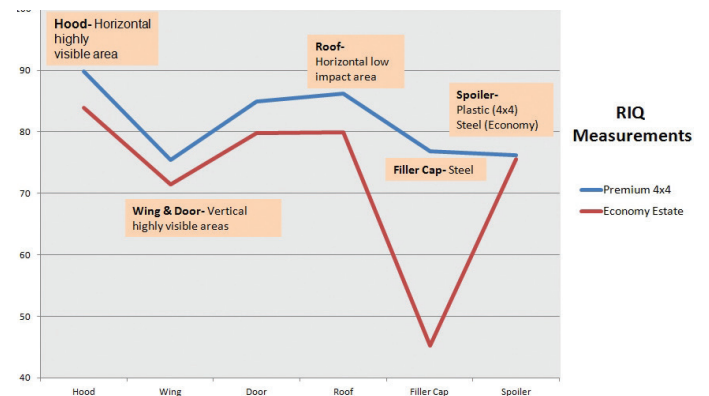
Rhopoint IQ-S - DOI

Quality differences between economy and premium are seen; poor orange peel on economy filler cap is shown, however horizontal and vertical surfaces are not differentiated.



Wavescan- DOI

The DOI values do not reflect differences between horizontally and vertically sprayed panels; premium and economy models are not differentiated.



RIQ Measurements

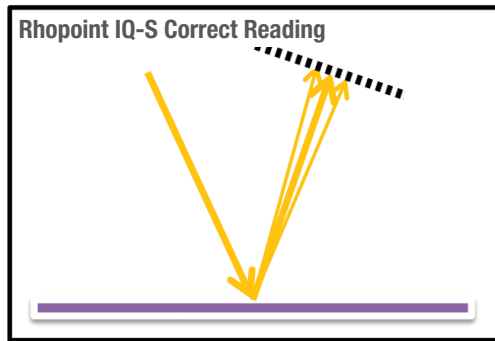
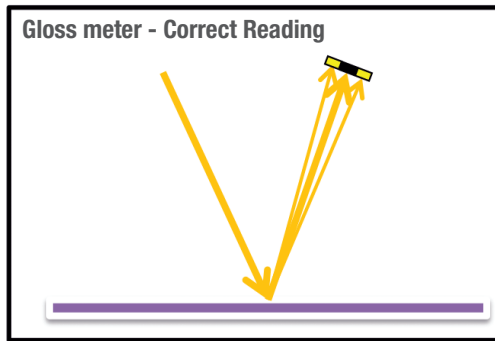
RIQ measurement is sensitive enough to appearance differences due to:

- Substrate alignment (horizontal/vertical)
- Coating formulation
- Substrate
- Application technique



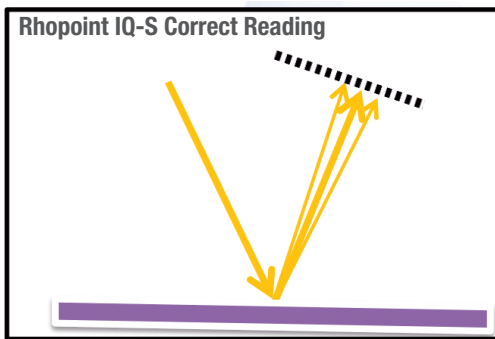
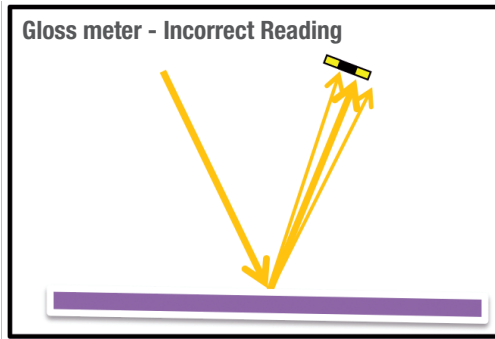
SAMPLE FLATNESS COMPENSATION

20° gloss & haze meters have fixed geometry. They require very flat surfaces to measure accurately.

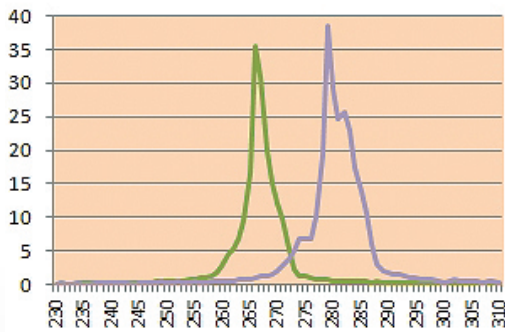


The Rhopoint IQ-S uses a 512 element sensor that measures at 20° +/- 7.25°. It mathematically determines the gloss angle.

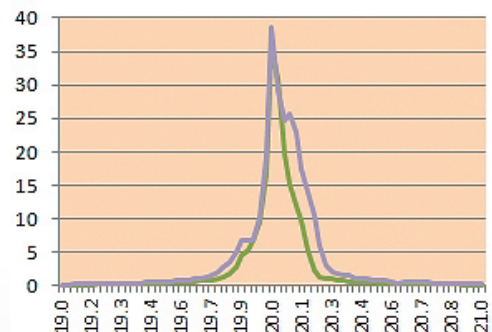
Non-flat surfaces cause light to reflect on an incorrect part of the sensor and give inaccurate gloss results.



Light is reflected on different parts of the diode array. The instrument automatically compensates.



Two similar appearance surfaces, one is curved- the reflected light falls away from the center of the array.



The instrument automatically compensates for non-flatness.

LAW OF REFLECTION

The direction of incoming light and the direction of outgoing light reflected make the same angle with respect to the surface.

Authorised distributor

In Australia:

For customer service, call 1300-735-292
To fax an order, use 1800-067-639
To email an order, ordersau@thermofisher.com

In New Zealand:

For customer service, call 0800-933-966
To fax an order, use 0800-329-246
To email an order, ordersnz@thermofisher.com