RHOPOINT INSTRUMENTS

RHOPOINT AMERICAS

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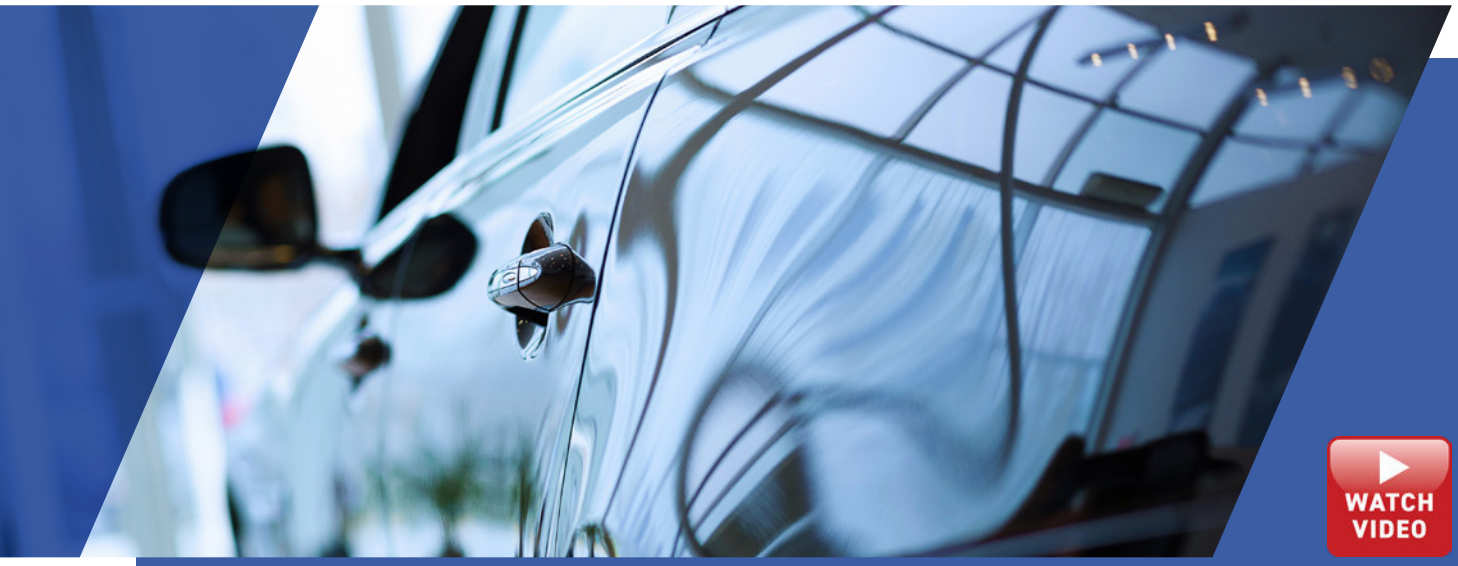
Manufactured by Rhopoint Instruments in the United Kingdom

RHOPOINT IQ FLEX 20

Rhopoint IQ Flex 20

- Designed for the measurement of small and curved surfaces
- DOI / RIQ Meter (quantify orange peel)
- 20° Glossmeter

The Rhopoint IQ Flex 20



The Rhopoint IQ Flex 20 quantifies surface quality problems such as orange peel and haze that are invisible to a standard glossmeter. It profiles how light is reflected from a surface.

Previously only available for measuring flat surfaces, this technology is now available in a new format specifically designed for curved surfaces, as well as small and delicate parts. Flex 20 gloss measurements are fully compatible with existing Rhopoint IQ results.

The Rhopoint IQ Flex 20 can measure:

- 20° Gloss
- Reflectance haze
- Reflected Image Quality (RIQ)
- Distinctness of Image (DOI)
- Goniophotometric curves
- RSPEC (peak specular reflectance)

What does the IQ Flex 20 measure?

The Rhopoint IQ GLOSS-HAZE-DOI-GONIOPHOTOMETER has been established as the reference instrument for measuring reflective appearance.

Combined gloss, haze and orange peel (DOI/RIQ values) information has made the IQ essential for controlling appearance finish. The Rhopoint IQ Flex 20 brings this technology to a new format specifically designed for curved surfaces, as well as small and delicate parts.

Measurement of curved surfaces

Conventional gloss instruments are suited to large flat test areas, as curved surfaces will cause errors. The small footprint of the IQ Flex 20 makes it much more effective on curved surfaces than a conventional glossmeter; its compact size and shape also allows access to difficult to reach areas.


For curved surfaces an adaptor is required

Measurement of small surfaces

The Rhopoint IQ Flex 20 can be customised with magnetically attached adaptor plates. These can be easily interchanged for different applications. The measurement spot size of these adaptor plates can be reduced to as low as 2mm.


Requires 4mm or 2mm adaptor for small parts

3D printed adaptors

Bespoke 3D printed adaptor jigs for repeatable control of curved surfaces (requires a .dxf drawing of the part to be measured).


Complex curve adaptor

Interchangeable adaptors

Easy customisation for every application with bespoke measuring adaptors

The Rhopoint IQ Flex 20 can be customised with magnetically attached adaptor plates to allow for the measurement of irregular surfaces. These can be easily interchanged for different applications.

Small surfaces

Reduced spot size

3D printed adaptor

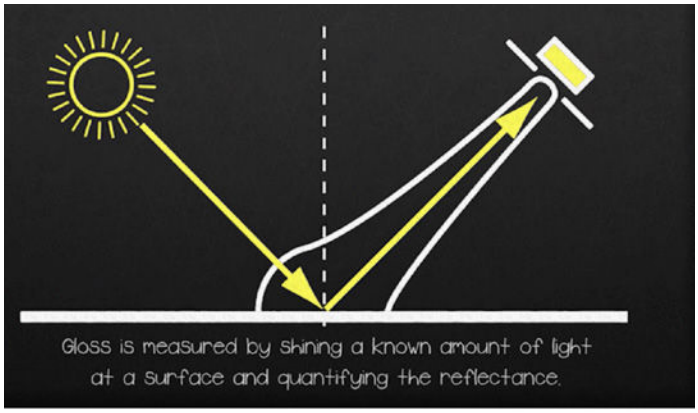
Convex surface

Complex curve

Concave surface

How is gloss measured?

Gloss is measured by shining a known amount of light at a surface and quantifying the reflectance.

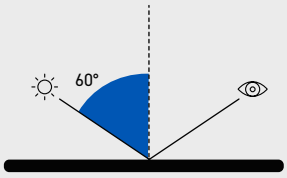


The angle of the light and the method by which the reflectance is measured are determined by the surface material and which aspect of the surface appearance is to be measured.

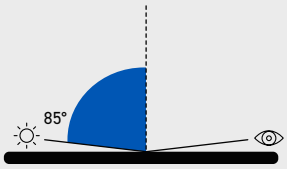
Which angle should I use for my application?

ISO 2813 and ASTM D523 (the most commonly used standards) describe three measurement angles to measure gloss across all surfaces.

Gloss is measured in gloss units (GU) and is traceable to reference standards held at a National Metrology Institute.

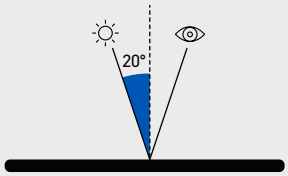


Universal Measurement Angle: 60°
All gloss levels can be measured using the standard measurement angle of 60°. This is used as the reference angle with the complimentary angles of 85° and 20° often used for low and high gloss levels respectively.



Low Gloss: 85°
For improved resolution of low gloss a grazing angle of 85° is used to measure the surface. This angle is recommended for surfaces which measure less than 10GU when measured at 60°.

This angle also has a larger measurement spot which will average out differences in the gloss of textured or slightly uneven surfaces.



High Gloss: 20°
The acute measurement angle of 20° gives improved resolution for high gloss surfaces. Surfaces that measure 70GU and above at the standard angle of 60° are often measured with this geometry.

The 20° angle is more sensitive to haze effects that affect the appearance of a surface.

Why measure gloss?

Gloss is an aspect of the visual perception of objects that is as important as colour when considering the psychological impact of products on a consumer.

It has been defined as 'The attribute of surfaces that causes them to have a shiny or lustrous, metallic appearance.' The gloss of a surface can be greatly influenced by a number of factors, for example the smoothness achieved during polishing, the amount and type of coating applied or the quality of the substrate.

Manufacturers design their products to have maximum appeal: from highly reflective car body panels to glossy magazine covers or matt finish automotive interior trim.

This is especially noticeable where parts may be produced by different manufacturers or factories but will be placed adjacent to one another to create the finished product.

It is important therefore that gloss levels are achieved consistently on every product or across different batches of products.

Gloss can also be a measure of the quality of the surface, for instance a drop in the gloss of a coated surface may indicate problems with its cure, leading to other failures such as poor adhesion or lack of protection for the coated surface.

It is for these reasons that many manufacturing industries monitor the gloss of their products, from cars, printing and furniture to food, pharmaceuticals and consumer electronics.

What is haze and why measure it?

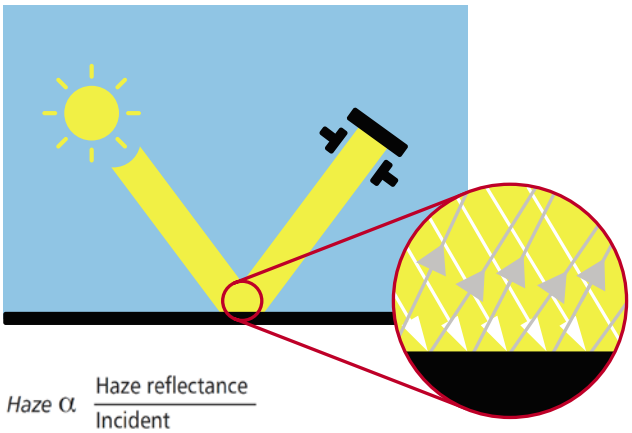
Haze can be described as near specular reflection. It is caused by a microscopic surface structure which slightly changes the direction of a reflected light causing a bloom adjacent to the specular (gloss) angle. The surface has less reflective contrast and a shallow milky effect.

In the coatings industry, this microscopic surface texture is often due to poorly dispersed raw materials, incompatible raw materials or oxidisation and weathering. For polished metal surfaces, haze is often associated with polishing marks or chemical residue.

Haze

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

Reflectance haze – An optical effect caused by microscopic texture or residue on a surface.



$$Haze \propto \frac{\text{Haze reflectance}}{\text{Incident}}$$

Reflection Haze

Reflection haze is an optical phenomenon usually associated with high gloss surfaces.

It is a common surface fault that reduces appearance quality. A hazy surface has a visibly shallower reflection with a milky finish and halos appear 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 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
- Polishing marks
- Cleanliness
- Ageing and oxidisation

Haze: Often visible as milky finish on high gloss surfaces

Gloss and Haze Measurement with Array Technology

The IQ Flex 20 uses a 512 element linear diode array which profiles reflected light in a large arc from 14° to 27°. The instrument processes this high resolution data, selecting individual elements within the array that equate to the angular tolerences outlined in international measurement standards.

In a single 20° measurement, the following calculations are made:

$$\text{Gloss} = \frac{\sum \text{Pixels between } 20° \pm 0.9° \text{ (sample)}}{\sum \text{Pixels between } 20° \pm 0.9° \text{ (standard)}}$$

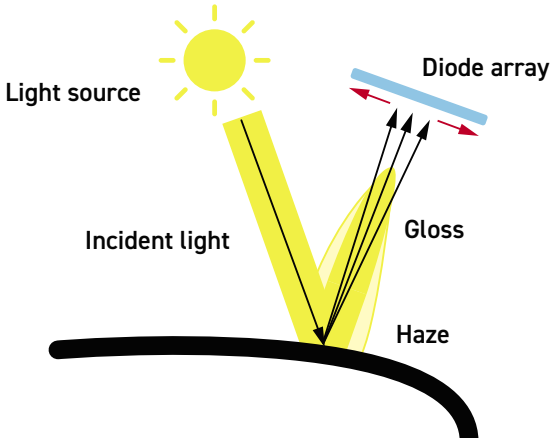
$$\text{Haze} = 100 \times \frac{\sum \text{Pixels from } 17° \text{ to } 19° \text{ (sample)} + \sum \text{Pixels from } 21° \text{ to } 23° \text{ (sample)}}{\text{Specular Gloss (standard)}}$$

$$\text{Log Haze} = 1285\ (\log10((\text{Haze}/20)+1))$$

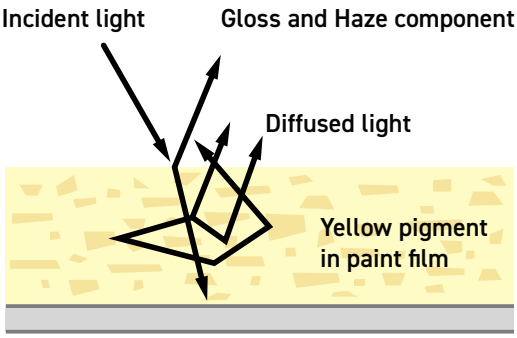
Curved Surface Adjustment

A major advantage of the IQ Flex 20 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 centre of the measurement sensor causing errors.

The IQ Flex 20 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 Flex 20 automatically adjusts for non-flat surfaces by sensing the reflected peak and virtually adjusting the position of the sensor.



The IQ Flex 20 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.

Diffuse Corrected Measurement with 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.

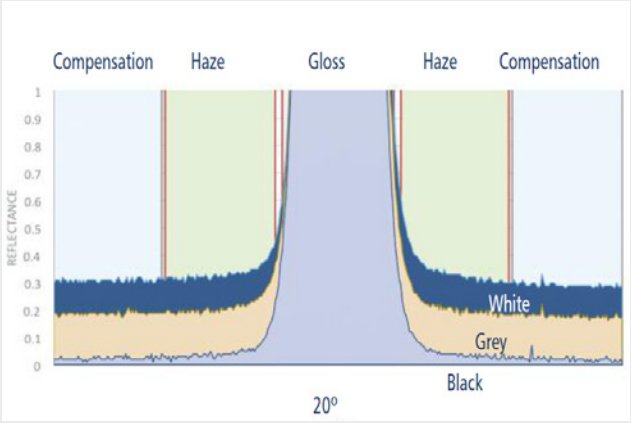
For white surfaces, bright colours and metallics, a certain amount of diffuse light, reflected from within the material, is also present in this region.

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

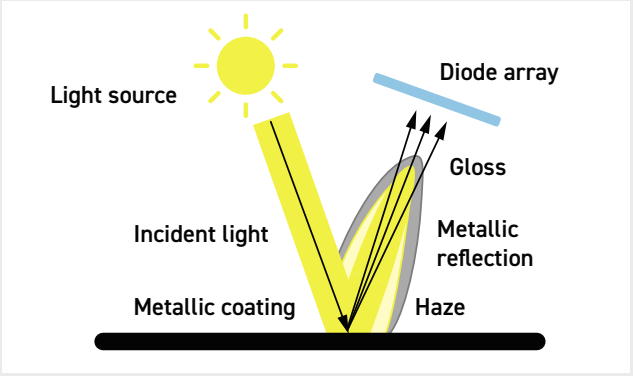
* Only enabled when the instruments is set to haze measuring mode of ASTM E430

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 metallic surfaces to be measured independently of their colour.

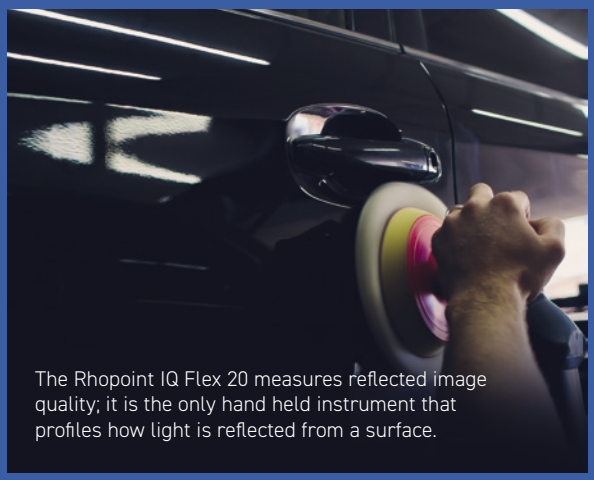


Goniophotometric information profiling the reflection from white, grey and black panels with an identical topcoat.



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

An advantage of the IQ Flex 20 is that unlike a conventional instrument, compensation is calculated using a region adjacent to the haze angle. This technique gives compatible readings on solid colours but also compensates for directional reflection from metallic coatings and speciality pigments.



The Rhopoint IQ Flex 20 measures reflected image quality; it is the only hand held instrument that profiles how light is reflected from a surface.

High gloss low orange peel

High gloss high orange peel

The Rhopoint IQ Flex 20 quantifies surface quality problems that are invisible to a standard glossmeter

Reflected Image Quality (RIQ)

RIQ is used to quantify effects such as orange peel and surface waviness. This new parameter gives higher resolution results compared to Distinctness of Image (DOI) measurement and better mimics human perception of surface texture, especially on high quality finishes.

Symptoms of Poor RIQ: Orange peel, brush marks, waviness or other structures visible on the surface. Reflected images are distorted.

Causes: Application problems, incorrect coating flow, coating viscosity too high/low, sag or flow of coating before curing, incorrect particle size/distribution, overspray, improper flash/re-coat time, inter coat compatibility, incorrect cure times or cure temperature.

Reflectance Haze Compensation

The instrument 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.

Hub with low reflectance haze

Hub with high reflectance haze

Distinctness Of Image (DOI)

A measure of how clearly a reflected image will appear in a reflective surface.

Reflectance Haze

An optical effect caused by microscopic texture or residue on a surface.

Visible Symptoms: A milky finish is apparent on the surface with a loss of reflected contrast. Halos and patterns can be seen around reflections of high intensity light sources.

Causes: Poor dispersion, raw material incompatibility, additive migration, vehicle quality, stoving/drying/curing conditions, polishing marks, fine scratches, ageing, oxidisation or poor cleanliness/surface residue.

Haze is a common problem associated with coatings and polished materials. Surfaces with haze have a milky finish with a shallow reflected image. This important characteristic is directly measured with the Rhopoint IQ Flex 20.

Features

Designed for the measurement of small and curved surfaces.

Touch sensitive button interface

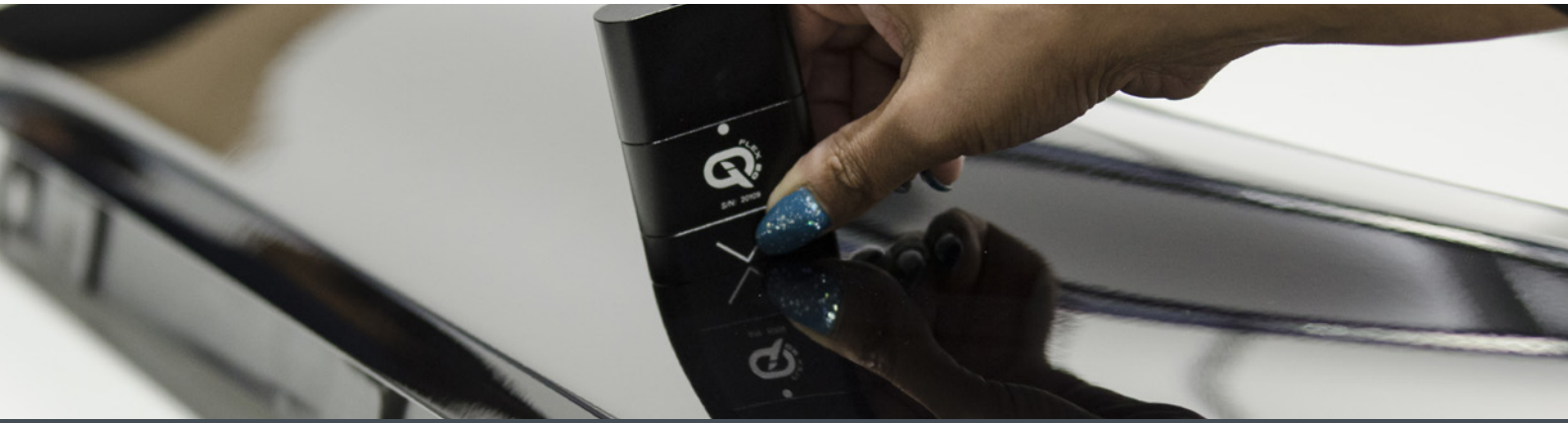
Easy to control and take measurements

Easy batching

User definable batch names and batch sizes for quicker and more efficient reporting

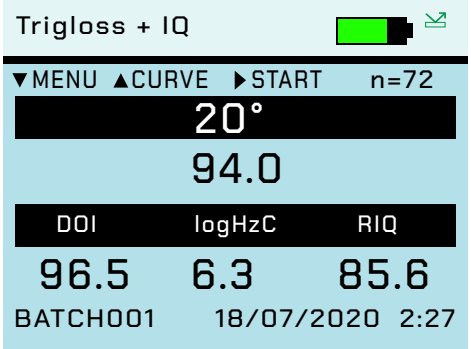
Automatic measurement

Single button push to initiate a defined number of measurements

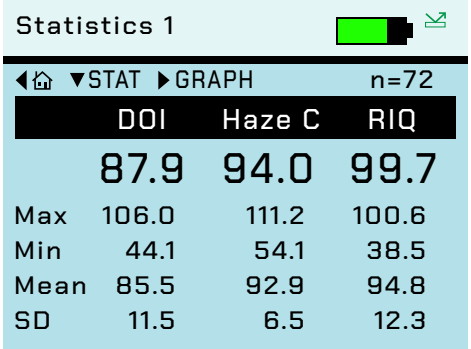


Measurement features

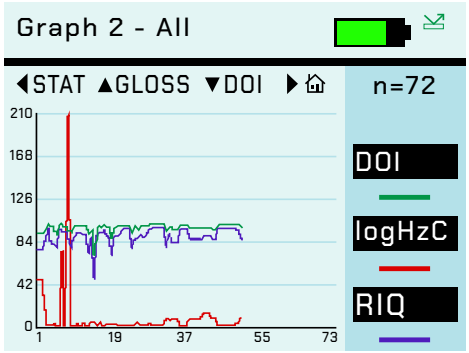
Fast measurement of all parameters and instantly transmit measured readings.



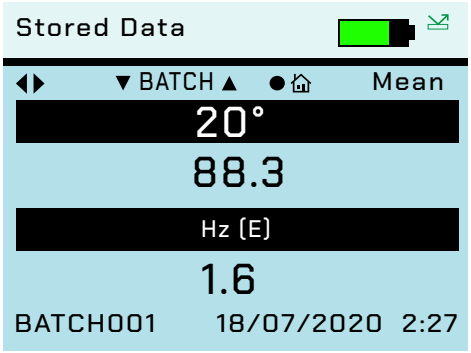
Measurement
Simultaneous measurement of all parameters, date and time stamped



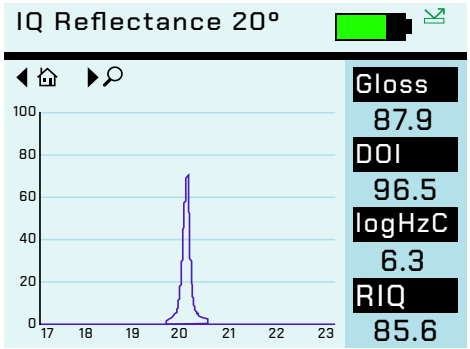
Statistics
Displays full statistics for the number of readings in the current batch.



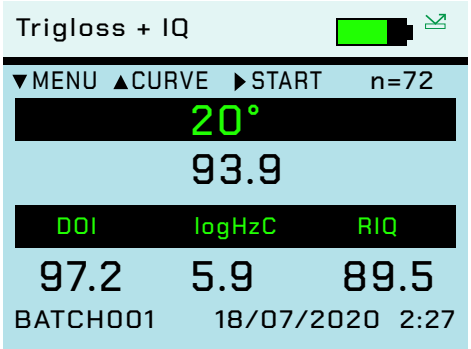
Graphs
Graphical reporting for quick trend analysis



Pass / Fail Parameters
Pass / Fail parameters can be defined for instant identification of nonconformances



Goniophotometric curves
Different types of surface textures produce identifiably shaped reflectance profile. This goniophotometric data can be downloaded to a PC for further analysis and comparison via the USB cable or Bluetooth data widget.



Stored data
View and inspect data saved on the instrument

Configuring the IQ Flex 20

Absolute v comparative measurement

Sample curvature naturally reflects light away from the measurement sensor. This can be compensated by using a smaller measurement spot which is less affected by the curvature. However, on highly curved surfaces readings should be used comparatively i.e. the same spot on similar shaped samples and is therefore ideal for comparing batch to batch consistency.

Repeatability

	IQ Flex 20	4mm Reduced Spot Size Adaptor	2mm Reduced Spot Size Adaptor	Curved Part Adaptor	Custom 3D Printed Adaptor
Flat surface	Excellent	Excellent	Excellent	Excellent	N/A
Large radius curved e.g. car body	Good	Good	Good	Good	Excellent
Cylinder >20mm ø	Poor	Poor	Poor	Good	Excellent
Cylinder <20mm ø	Not recommended	Not recommended	Not recommended	Poor	Varies according to application
Small flat parts >10 x 10mm	Excellent	Excellent	Excellent	Not recommended	Excellent
Small flat parts <10 x 10mm	Poor	Varies according to application	Varies according to application	Not recommended	Excellent
Complex shapes (curved in both directions)	Not recommended	Not recommended	Not recommended	Not recommended	Excellent

Above comments are made with measuring head used correctly as described

Correlation to standard glossmeter readings by gloss level

	IQ Flex 20	4mm Reduced Spot Size Adaptor	2mm Reduced Spot Size Adaptor	Curved Part Adaptor	Custom 3D Printed Adaptor
Flat surface – high gloss >50GU at 20°	Excellent	Excellent	Excellent	Excellent	N/A
Flat surface – mid gloss 30-50GU at 20°	Excellent	Good	Good	Excellent	N/A
Flat surface – low gloss <20 at 20°	Excellent	Good	Not recommended	Excellent	N/A

Above comments are made with measuring head used correctly as described

Correlation to standard glossmeter readings by sample shape

	IQ Flex 20	4mm Reduced Spot Size Adaptor	2mm Reduced Spot Size Adaptor	Curved Part Adaptor	Custom 3D Printed Adaptor
Large radius curved (car body)	Good	Good	Good	Good	Excellent
Cylinder >20mm ø	Good	Good	Good	Good	Excellent
Cylinder >20mm ø	Comparative reading	Comparative reading	Comparative reading	Comparative reading	Comparative reading
Cylinder <20mm ø	Not recommended	Not recommended	Not recommended	Poor	Varies according to application
Small flat parts	Excellent areas >8mm x 8mm	Good >4mm x 4mm	High gloss: Good Areas >2mm x 2mm Poor for low gloss finishes	Not recommended	Excellent
Complex shapes (curved in both directions)	N/A	N/A	N/A	N/A	N/A

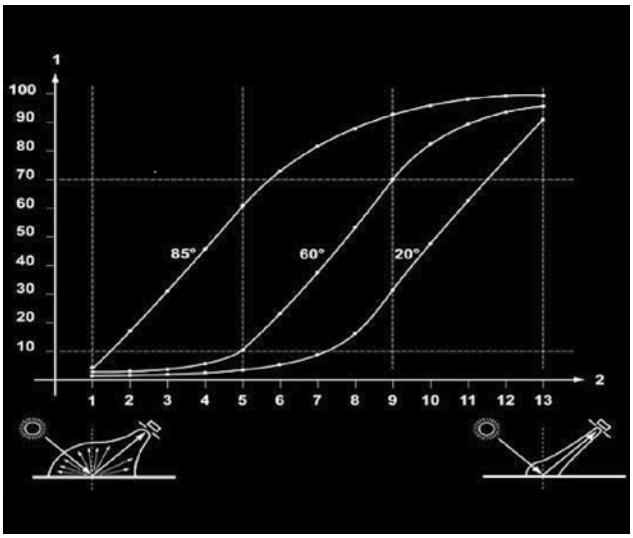
Above comments are made with measuring head used correctly as described

Gloss Levels Measured

ISO2813 recommends surfaces measuring mid to low gloss finishes using 60° and 85°. Is the Flex 20 suitable or measuring these surfaces?

60° and 85° give greater resolution of measurement at these gloss levels (small visible differences in finish = a large difference in gloss value).

Whilst 20° has a smaller measurement resolution, visible differences in gloss can be quantified with the Flex 20.



The measuring head should only be connected to the instrument for measuring larger flat surfaces.

It is recommended to connect the instrument to the measuring head using the cable for ease and stability of measurement.

Adaptors

Custom adaptors

Custom adaptors will increase the repeatability of measurement for irregular shaped objects, curved surfaces or small parts.

Curved part adaptors

Curved part adaptors should be used for the measurement of all cylindrical objects.

Calibration

For accurate measuring calibrating the IQ Flex 20 every day, when changing between standard head and 2/4mm adaptor is essential.

	Measuring less than 100 GU (plastics and coatings)	Measuring polished metals >100GU
Standard spot size	Calibrate on black tile every shift (8 Hours) MUST BE RE-CALIBRATED with standard spot size adaptor when switching from small spot size measurement.	Calibrate on optional mirror tile (if required) MUST BE RE-CALIBRATED with standard spot size adaptor when switching from small spot size measurement.
Small spot size	Calibrate with small spot size adaptor (8 Hours) MUST BE RE-CALIBRATED with small spot size adaptor when switching from standard spot size measurement.	Calibrate on optional mirror tile (8 Hours) MUST BE RE-CALIBRATED with small spot size adaptor when switching from standard spot size measurement.

IQ Flex 20 with standard spot size adaptor

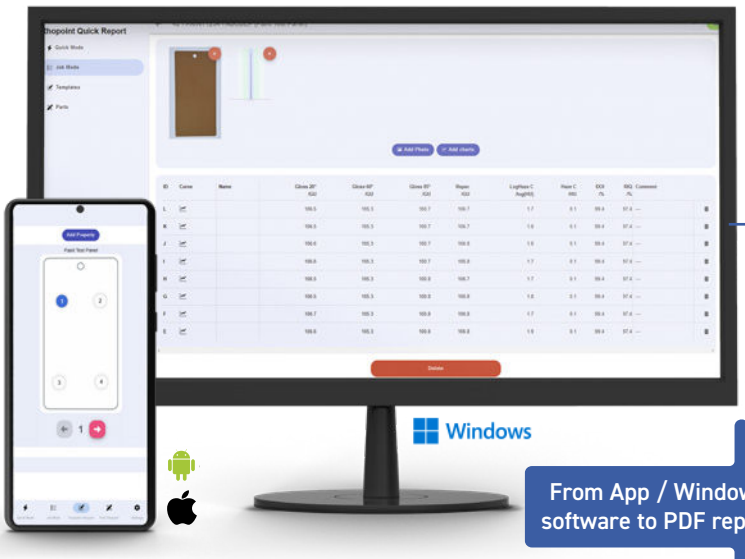
IQ Flex 20 with calibration tile

Measuring process

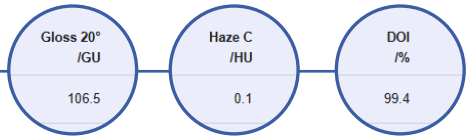
- Ensure that the instrument is calibrated following the procedure in the product manual.
- Select the measuring adaptor appropriate for the surface to be measured.
- Place the measuring head on the surface and hold this as indicated.
- Ensure that the no ambient light can be detected by the measuring head.

The Rhopoint Quick Report App

The Quick Report App from Rhopoint is a quick and easy to use reporting package designed to enhance the functionality & reporting capabilities of the Rhopoint IQ Flex 20.

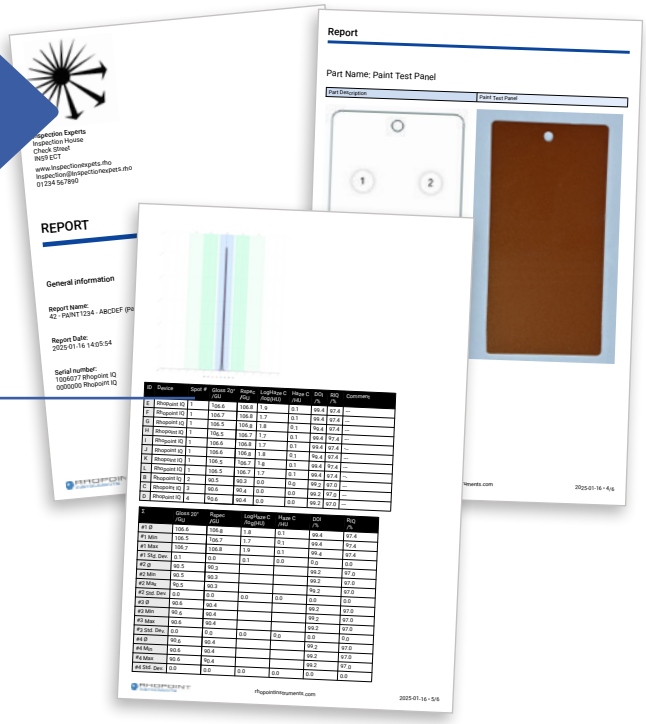


RHOPOINT QUICK REPORT



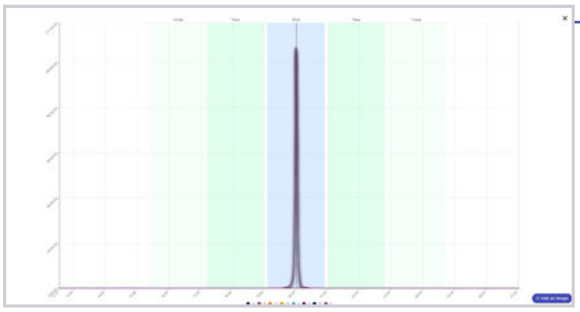
Values for all measured parameters given per measurement spot

From App / Windows software to PDF report



1. Configure a template of your sample to be tested and add measurement spots.

2. Make measurements directly into the app.



Full goniophotometric curves for each reading

- Simplify data collection & processing.
- Create custom templates.
- Add images.
- Create branded reports.

3. Readings are transferred from the measurement device to the app via Bluetooth allowing customised PDF reports to be easily generated.

The app will work on Android, IOS and a PC using web browser or application installation.

app.rhopointinstruments.com

Available on the App Store

GET IT ON Google Play

Applications

The DOI, Haze and RSPEC values measured by the Rhopoint IQ Flex 20 allow the user to quantify and control the surface textures that reduce the perceived quality of manufactured products.

Automotive body

Polished metals

Smart phones, tablets & laptops

Yacht manufacturers

Automotive interior

Curved surfaces

Cosmetics

PVC

Accessories

Instrument with 20˚ Flex head and USB data cable

Calibration tile with holder

Calibration certificates for the instrument and tile

Also included:

1 x USB drive containing:

- Instruction manual
- Bluetooth data app
- Example Microsoft Excel spreadsheets
- Instructional videos

Order codes - adaptors	
Rhopoint IQ Flex 20	A6000-016
Adaptor for reduced spot size (4mm)	B6000-501/2
Adaptor for reduced spot size (2mm)	B6000-502/2
Curved part adaptor	M6000-504/NEW
Customer adaptor (requires drawing of the part to be measured in .dxf format)	M6000-505

Free extended 2 year warranty: Requires registration at www.rhopointinstruments.com within 28 days of purchase. Without registration, 1 year standard warranty applies.

Free light source warranty: Guaranteed for the life of the instrument

Calibration and service: Fast and economical service via our global network of accredited calibration and service centres. Please visit www.rhopointinstruments.com for detailed information.

Specifications

Gloss		20° Gloss
Range (GU)	0-100	100-2000
Repeatability	0.2(GU)	0.2%
Reproducibility	0.5(GU)	0.5%
Resolution (GU)	0.1	
Measurement area	6mm x 6.4mm	
Standards	ISO 2813, ASTM D523, ISO 7668, ASTM D2457, DIN 67530, JS Z 8741	
Calibration standard	Traceability: NIST traceable, Uncertainty: 1.1GU	

RSPEC	Details
Peak specular reflectance	20° ±0.09905°
Measurement range	0GU - 2000GU

Haze	Details
Near specular reflectance	Measured at 17.2° - 19°, 21° - 22.8°
Switch-able between	Haze Units (HU) and Log Haze Units(LogHU)
Resolution	0.1HU
Repeatability	±0.5HU
Reproducibility	±1.5HU
Standards	ASTM E430 ISO 13803

RIQ	Details
Resolution	0.1
Repeatability	±0.2
Reproducibility	±0.5
Measurement range	0 - 100

DOI	Details
Resolution	0.1
Repeatability	±0.2
Reproducibility	±0.5
Measurement range	0 - 100
Standards	ASTM E430 ISO 13803

Instrument specification	Details
Power	Rechargeable lithium ion, 6 hours operation 4,000+ readings per charge
Recharge time	Mains charger: 4hrs
Memory	8MB = 999 readings
Dimensions	150mm (H) x 79mm (W) x 34mm (D) - without head
Packed dimensions	180mm (H) x 330mm (W) x 280mm (D)
Weight	550g
Packed weight	≈1.5kg
Commodity code	9027 5000

RHOPOINT INSTRUMENTS

RHOPOINT AMERICAS

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We offer two options for you to try out the Rhopoint IQ Flex 20 before buying

1. **Online demonstration:** Online presentation of the Rhopoint IQ Flex 20 with your samples measured LIVE on Microsoft Teams. Includes a consultation with an application specialist.

2. **Factory sample testing:** Send in samples of your material for testing and receive a comprehensive test report.

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