OPERATING INSTRUCTIONS

Thank you for purchasing this Rhopoint product.
Please read these instructions carefully before operating this product and retain them for future reference. The images shown in this manual are for illustrative purposes only.

This instruction manual contains important information about the setup and use of the Detailometer. It is essential that the contents be read before powering up and operating the instrument.

If this instrument is passed to other users you must ensure that the instruction manual is supplied with the instrument. If you have any questions or require additional information about the Detailometer please contact the Rhopoint Authorised Distributor for your region.

The technology and components used in the device are based on state-of-the art optic and electronics. As part of Rhopoint Instruments commitment to continually improving the technologies used in their products, they reserve the right to change information included in this document without prior notice.

Contents

Storage and handling

This instrument contains precision optics and electronics. You should avoid knocking or dropping the device as the resulting impact could cause serious damage.

In some circumstances the optical components in the instrument could become misted due to temperature change. It is recommended that the instrument is not used until it has stabilised to ambient temperature.

Ensure that the instrument is not exposed to moisture, chemicals or to any corrosive vapours.

Do not interfere or place any objects inside the measuring aperture as damage to the measuring system could occur.

The instrument housing and screen are normally resistant to a variety of solvents however it is not possible to guarantee resistance to all chemicals therefore the surfaces of the instrument should only be cleaned using a soft, moist cloth.

Prevent exposure of the instrument to direct sunlight for prolonged periods and to continuous humidity and condensation.

About the Detailometer

The **Detailometer** is an advanced measuring instrument used to quantify the quality of surface appearance.

Unlike a standard glossmeter, it has the capability of measuring and detecting quality problems caused by microscopic texture in the surface that cause haze and orange-peel effects which lead to poor **Distinctness of Image (DOI)**.

These factors can seriously affect the visual impact and reflective quality of many coated, painted and polished surfaces. By measuring the quality of the reflected image, it accurately profiles how light is reflected from a surface.

At 20° the Detailometer uses a diode array to measure the distribution of the reflected light at +/- 7.25° from the specular angle of reflection in steps of 0.02832°.

This technology allows the instrument to calculate **Gloss**, **Haze**, **DOI**, **RIQ** and **RSpec** providing the user with a complete analysis of the reflective quality of the surface.

Definitions of each of the parameters measured by the Detailometer can be found in the section **Appearance Theory** detailed later in this manual.

Accessories

The instrument is supplied as a standard package complete with all accessories required to calibrate and recharge the unit including:

- Detailometer Glossmeter / Goniophotometer.
- NIST traceable high gloss calibration tile including UKAS certificate.
- Cleaning cloth for calibration tile.
- NIST traceable instrument certificate.
- USB mains charger with four selectable mains input connectors (UK/Europe/US/Australia).
- USB PC cable.
- Quick Start operating instructions.
- Protective instrument carry case.

Functional Overview
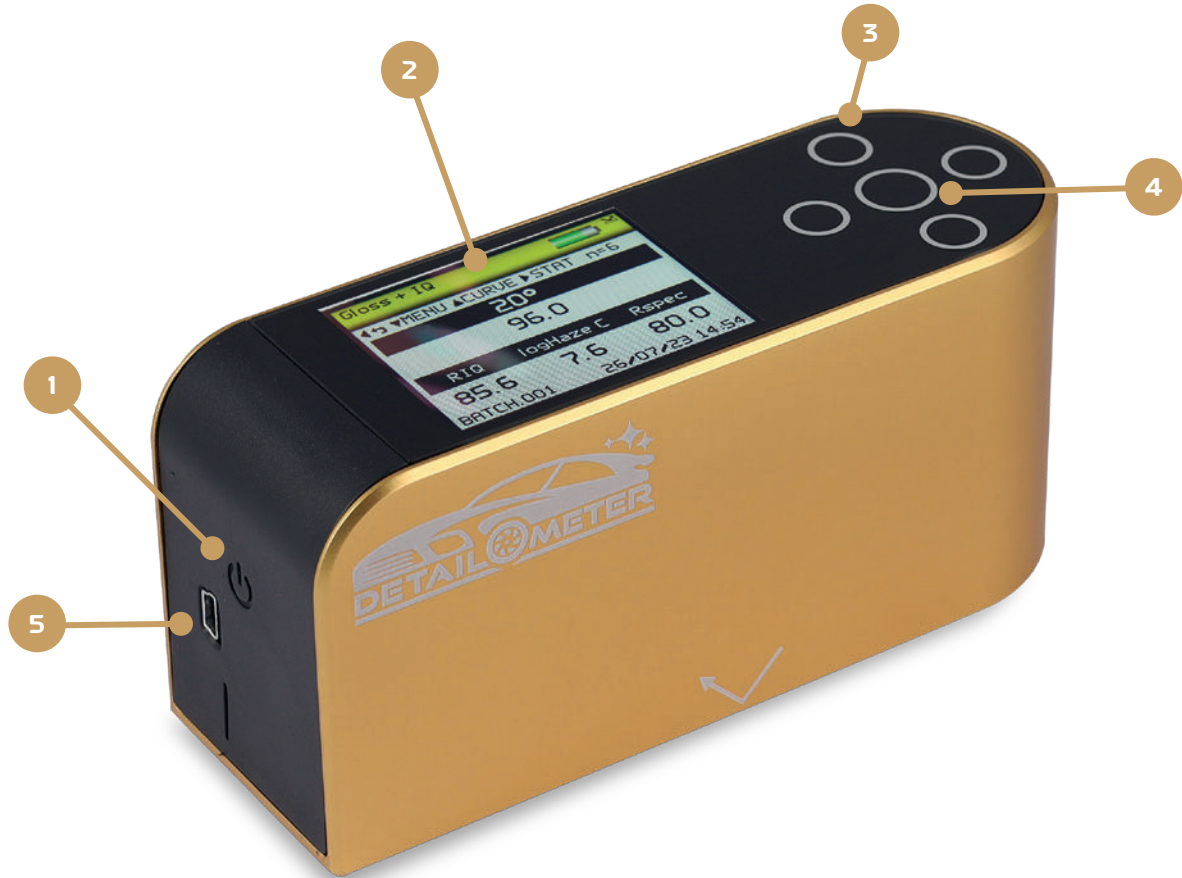
Label No.	Function
1	On / Off Button
2	High Resolution Graphic Display
3	Up / Down / Left / Right Buttons
4	Operate / Enter Button
5	Mains / USB Charger Input Connector

The instrument is controlled by pressing the relevant touch sensitive button.

Functionality is dependent on whether the instrument is in menu or operate mode as detailed in the operation sections that follow.

Icons used

Tabs	Function
	Home
	Measure / Enter
	Right
	Up
	Down
	Left
	Power off

Power

The Rhopoint Detailometer is powered by an integrated high capacity lithium ion cell.

Fully charged the instrument will operate continuously for >17 Hours or >20,000 readings.

A mains powered USB charger is provided with the unit. This will fully charge the unit when connected to the unit's USB input (6) in up to 9 hours.

Alternatively, the instrument can be powered and charged using the USB cable attached to any compatible USB host (e.g. laptop etc.), Please note that charging from a USB host such as a laptop may take longer due to the lower current available.

USB Connectivity

Three functions are available when the Rhopoint Detailometer is connected to a computer using the USB cable supplied.
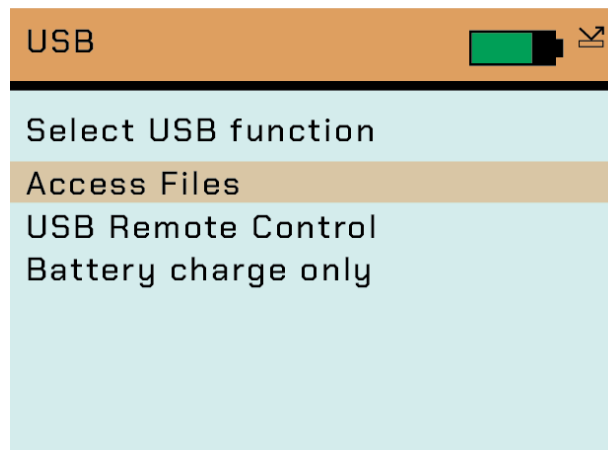
Access Files – Allows access to configuration files on the instrument. The instrument appears as a USB drive named IQ-METER. When selected the display on the instrument shows a USB memory key as shown below.
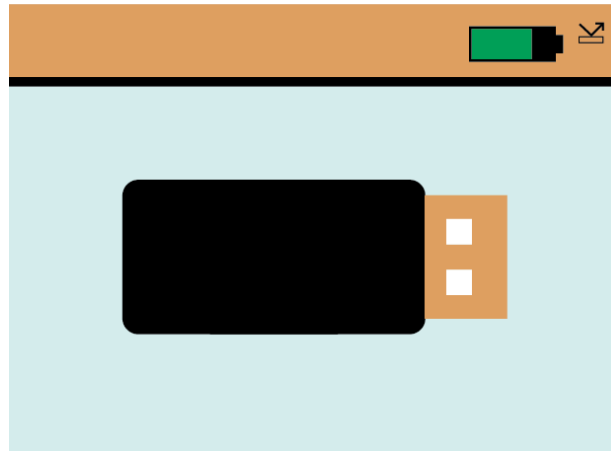
 USB Remote Control - Allows control of the Detailometer remotely by sending ASCII commands from a computer or PLC. In this mode the instrument displays **REMOTE CONTROL ACTIVE** on the main measurement screen.

 Battery Charge Only – Allows USB charging of the instrument – all instrument functions are available however do not operate the instrument whilst it is connected via USB and/or charging.

Switching the Instrument on

To switch the Rhopoint Detailometer on, press the ⏻ **On / Off button** located near the USB socket.

The instrument will display the Detailometer logo and then the Home screen displaying measurement parameters according to the instruments default settings or those previously configured.

Similarly, the instrument can be powered off (dependent on configuration – see Instrument Setup) by pressing the ⏻ **On / Off button** for three seconds.

Operation

With the unit switched on and initialised the Detailometer will display the **Home screen** as shown below.

```
Gloss + IQ                    [====]  ↘

▼MENU ▲CURVE
        20°
       100.7
   RIQ      logHaze C     Rspec
   92.3        0.1       100.7
                    26/10/23    16:41
```
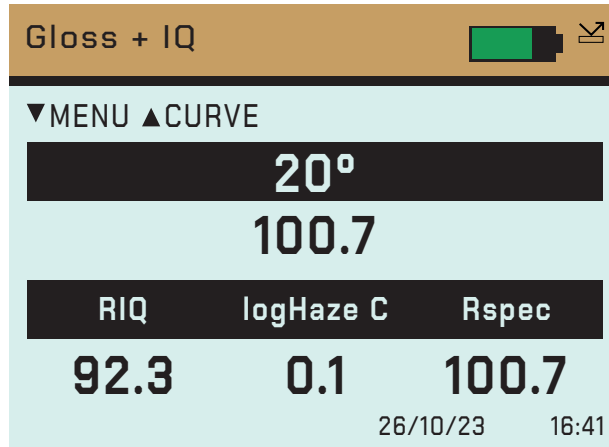
In this mode, measurements can be made by simply pressing the ⊕ **Measure / Enter** button on the instrument's keypad.

Before each measurement the Detailometer automatically detects whether a calibration standard is fitted. With the Auto Calibration option set to **ON** in the settings menu (detailed later in the Instrument Settings section of this manual) a dialogue box will appear when the ⊕ **Measure / Enter** button is pressed as shown below.

```
Gloss + IQ                    [====]  ↘

▼MENU ▲CURVE
   ┌─────────────────────────────┐
   │      Tile Detected          │
   │      Assigned Values        │
   │  20° :99.9  60° :99.7  85° :99.6 │
   │   CALIBRATE       MEASURE   │
   └─────────────────────────────┘
   92.3       0.1       100.7
                    26/10/23    16:41
```
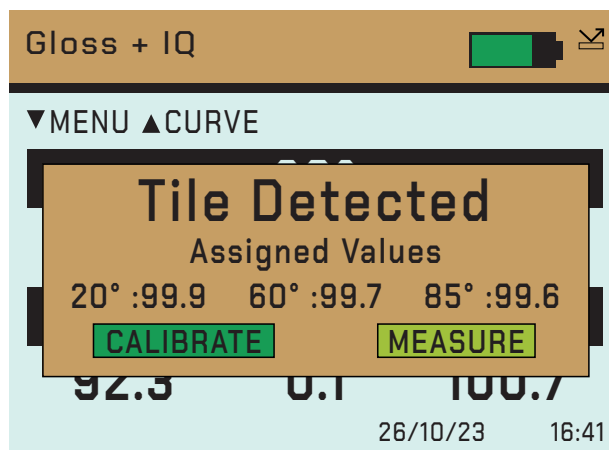
Two options are available: either to **Calibrate** the instrument on the calibration standard before making the measurement or to **Measure** without performing a calibration. Press the ⊕ **Left / Right** and ⊕ **Enter** buttons on the keypad to select the required option.

If **Calibrate** is selected the instrument will perform a calibration on the calibration standard and display a confirmation dialogue box when completed. Selecting the **Confirm** option will save the calibration information to the instrument's memory.

Alternatively, if **Cancel** is selected the display will return to the **Home screen**.

If **Measure** is selected, the instrument will perform a measurement and display the results after 3 - 4 seconds.
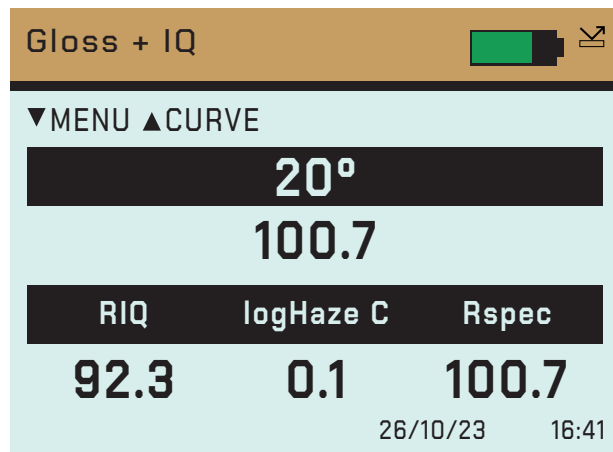
In the **Home screen** press the ⊕ **Up** button to access the **Reflectance curve screen**. The goniophotometric profile and data for the last 20° measurement is displayed.
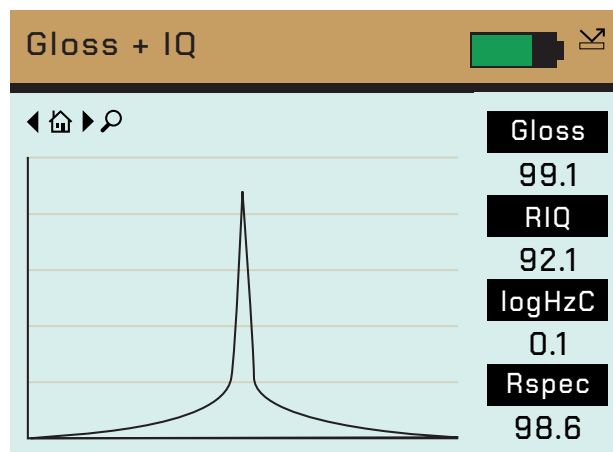
Menu Screen

The **Menu Screen** is used for quick access to often used options.

Press the ⣿ **Up / Down** buttons to navigate through the options, and press the ⣿ **Enter** button to select the option required.

```
Menu                    🔋 ⤲

◀ ⌂ ▶ SETUP
Calibrate Instrument
Switch Off
```
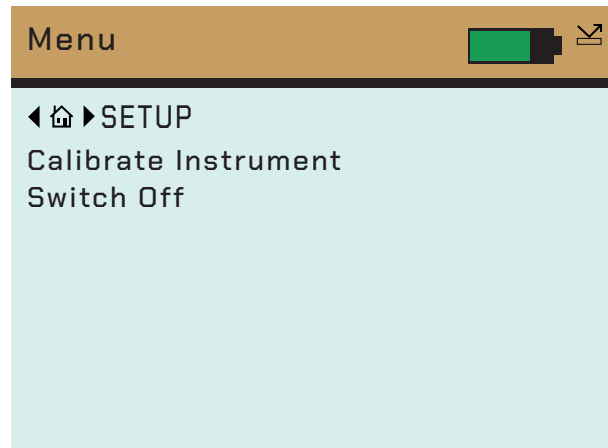
Options in the **Menu screen** are:

Calibrate Instrument – Perform a calibration of the instrument as detailed under **Operation**.

Switch Off – Turn off the instrument.

Press the ⣿ **Left** button to return to the **Home screen**.

Press the ⣿ **Right** button to access the **Setup screen**.

Setup Screen

The **Setup Screen** is used to customise the instrument to the user's preference.

Press the ⬡ **Up / Down** buttons to navigate through the options, press the ⬡ **Enter** button to select the option required.

```
Menu                          ▭▮  ⬦

  ◀ BACK
    Calibration Menu
    Measurement Menu
    Control Menu
    Instrument Setup
    Factory Menu
    About
```
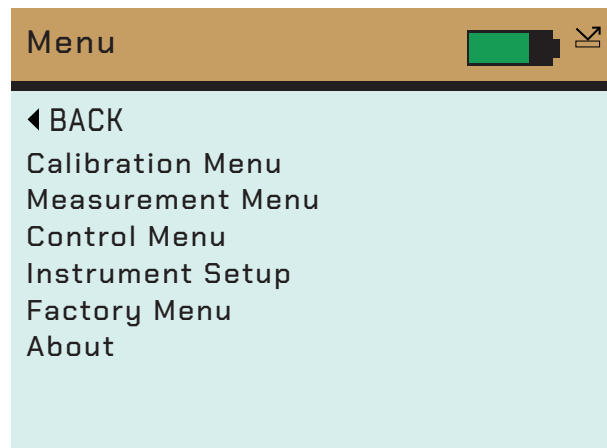
Calibration Menu   Calibration options (See **Calibration Menu** Screen)

Measurement Menu   Geometry setup (See **Measurement Menu** Screen)

Control Menu   Bluetooth setup (See **Control Menu** Screen)

Instrument Setup   Language, Date / Time and Power options
                           (See **Setup Menu** Screen)

Factory Menu   Pin locked menu options for Rhopoint Authorised
                           Service Centres

About Menu   Information about the instrument's firmware version,
                           serial number and last date of Factory Calibration

Press the ⬡ **Left** button to return to the **Home screen**.

Calibration Screen

```
Calibration                    ▭▮  ⊻

◀ BACK
Calibrate Instrument
Auto Calibration    : OFF
Calibrate to        : BLACK
Tile Value 20       : 99.9
Error Detection     : OFF
Haze Tolerance      : 0.5
```

The **Calibration Screen** is used to setup the instrument calibration to the user's preference.

Press the ⊕ **Up / Down** buttons to navigate through the options, press the ⊕ **Enter** button to select the option required. Options in the Calibration screen are:

Calibrate instrument   Performs an instant calibration of the instrument; a dialogue box being displayed upon completion to either **Cancel** or **Confirm.**

Auto Calibration   Set to **ON**, a dialogue box appears each time a measurement is taken as detailed under Operation.

Set to **OFF**, the dialogue box is disabled; measurements are made.

Calibrate to   Set to **Black** - a traceable gloss tile is used as the calibration standard.

Set to **Mirror** - a traceable mirror tile is used as the calibration standard (optional).

Tile Value 20	Set the calibration values for either standard being used for calibration. Pressing the ⊕ Enter button selects the value. Press the ⊕ Left / Right buttons to select the relevant digit and the ⊕ Up / Down buttons to increment / decrement the value. Press the ⊕ Enter button again to save the value.
Error Detection	Set to **ON** the instrument detects the condition of the calibration standard being used. If there are fingermarks or debris which cause it to fall outside the value set in **Haze Tolerance** an error message is displayed before calibration requesting that the tile be checked for cleanliness. Set to **OFF** - Values are still checked against the stored reference but no other error checking is carried out.
Set to CAL	A check is made to see if an appropriate hardware channel is wildly different to what it should be, indicating that the calibration is being attempted on the wrong tile type.
Set to Hz	A check is carried out on the haze value, if this is higher than expected the tile could be contaminated. Set to **CAL + Hz** - A combination of the two above.
Haze Tolerance	Set the tolerance for the standard being used for calibration. An ideal calibration standard should have zero haze, therefore setting this value anywhere between **0 – 9.9** defines the acceptable pass band.

Measurement Screen

```
Measurement              [====]  ⌄̲
◀ BACK ▶ IQ
Pass/Fail
Auto Measure    : 2 Sec
Range           : Auto
Geometry        : 20/60/85
Reflectance     : GU
```

The **Measurement Screen** is used to configure the instruments measurement parameters to the user's preference. Press the ⦿ **Up / Down** buttons to navigate through the options, press the ⦿ **Enter** button to select the option required.
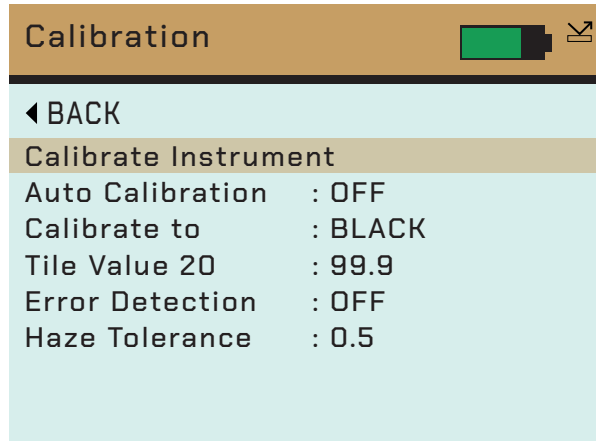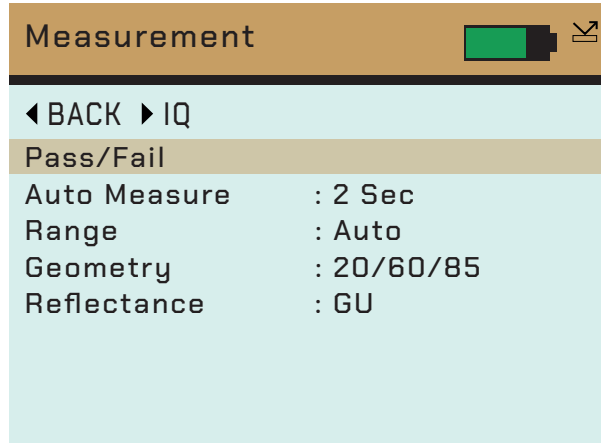
Selectable settings in the **Measurement screen** are:

Pass/Fail	Enters the Pass/Fail set up screen.
Auto Measure	Enables or disables automatic measurement mode, used for monitoring surfaces for changes over a period of time. Press the ⦿ **Enter** button to select the required measurement frequency of either 2, 5, 10, 30 or 60 seconds. When auto measure mode is activated, a dialogue box is displayed after the ⦿ **Enter** button is pressed and before the beginning of the measurement sequence, indicating that it is activated. To stop auto measure simply press the ⦿ **Enter** button once again at any time during the sequence.
Range	Selects gloss measuring range to:

Auto – Full range

Black – Standard gloss scale

Mirror - Extended scale for highly reflective materials, polished metals, requires calibration using Mirror standard.

| Geometry | Shows the angle(s) required for measurement either: |
| | 20 individually |

Reflectance	Selects the measurement unit to be displayed for:
	% - display percentage reflectance,
	100% reflectance = 2000GU@20 degrees,
	GU - display Gloss Units.

Press the **Left** button to return to the **Home screen.**

With **Reflectance** set to **% measurement** results for each angle are displayed as:

Gloss + IQ

▼MENU ▲CURVE

20º

4.9

RIQ	logHaze C	Rspec
92.3	0.1	100.7

26/10/23   16:41
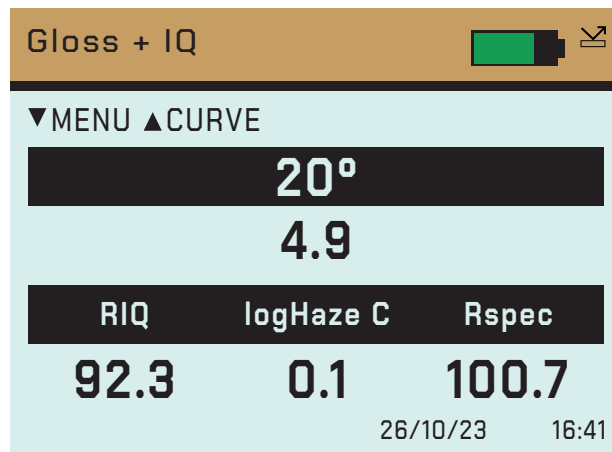
With **Reflectance** set to **GU measurement** results for each angle are displayed as:

Gloss + IQ

▼MENU ▲CURVE

20º

100.7

RIQ	logHaze C	Rspec
92.3	0.1	100.7

26/10/23   16:41

Pass/Fail Setup Screen

```
Pass/Fail                    [====]  ↘

◀ BACK  ▶ EDIT
Pass/Fail          : OFF
                   : Max       Min
20°                : 90.0      0.0
Hz/logHz           : 100.0     0.0
DOI/RIQ            : 100.0     0.0
Rspec              : 100.0     0.0
```
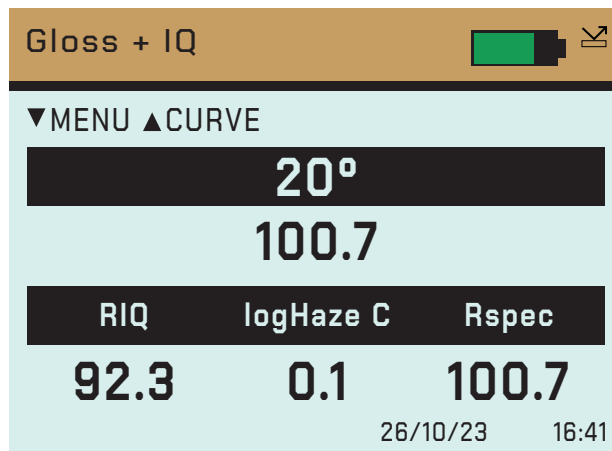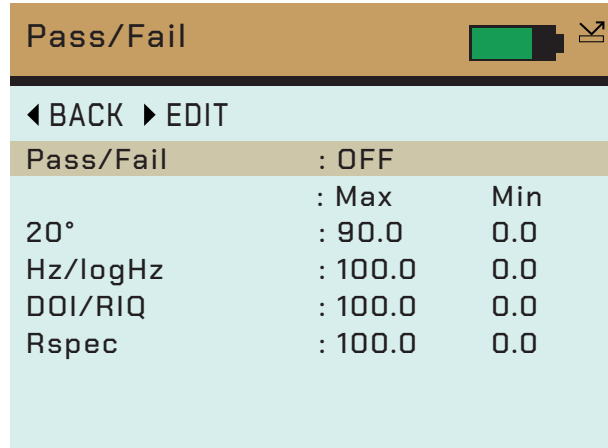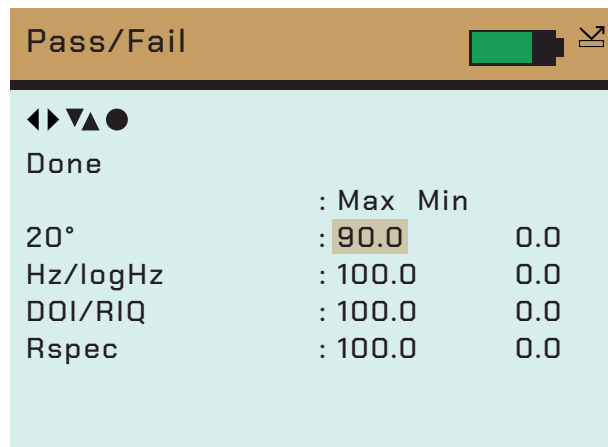
The **Pass/Fail setup screen** is used to enable / disable on-screen pass / fail indication and set min / max tolerancing. Press the down key to select the **Pass/Fail** option and press the centre button to toggle the feature **ON** or **OFF**.

Press the ⊕ **Right** button to edit the min / max limits.

```
Pass/Fail                    [====]  ↘

◀▶ ▼▲ ●
Done
                   : Max   Min
20°                : 90.0       0.0
Hz/logHz           : 100.0      0.0
DOI/RIQ            : 100.0      0.0
Rspec              : 100.0      0.0
```

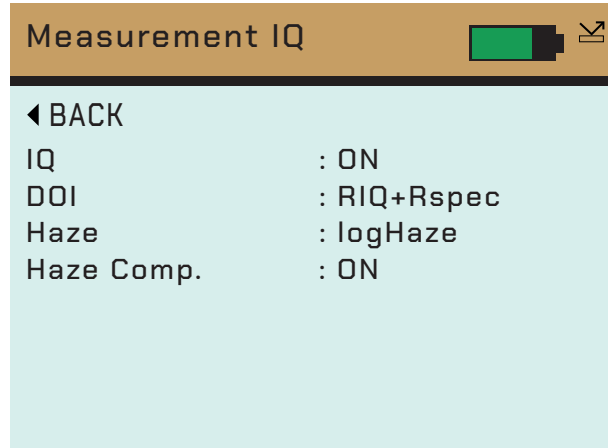Select the **Done** option to complete the process.

Once the **Pass/Fail** feature is enabled, any measurement that falls between the max and min values will be considered a pass and the header text will be coloured **GREEN**. Readings above the max value or below min value will be deemed a fail and the header text will be coloured **RED**. Saved data and data transmitted by Bluetooth will also contain the pass/fail field.

Gloss + IQ		
◀↩▼MENU ▲CURVE ▶		
20º		
100.7		
RIQ	logHaze C	Rspec
92.3	1.6	73.0
	26/10/23	16:41
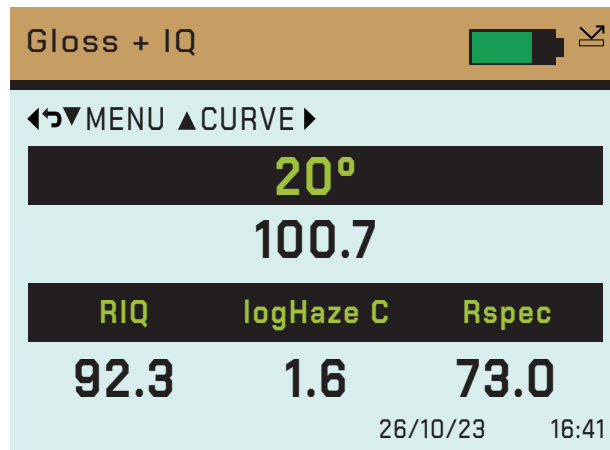
Note – The Pass / Fail option is not available when % reflectance mode is selected.

IQ Screen

```
Measurement IQ                    �█▇▌ ↰

◀ BACK
IQ                  : ON
DOI                 : RIQ+Rspec
Haze                : logHaze
Haze Comp.          : ON
```

The **IQ screen** is used to configure the instruments' IQ settings.

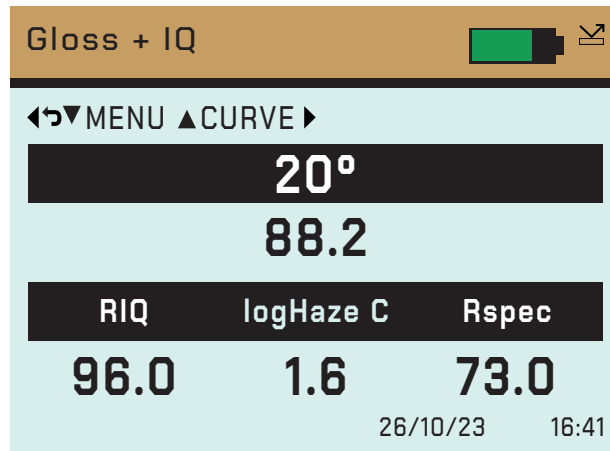|	
IQ	Selects IQ information to be either displayed (ON) or not displayed (OFF) on screen.
DOI	Selects either **standard DOI** (Distinctness of Image) or **enhanced RIQ** (Reflected Image Quality) scale or **Rspec** (peak specular reflectance), details of which can be found in the **Appearance Theory** section of this manual.
	Display configurations options are: DOI & RIQ, RIQ & Rspec or DOI & Rspec.
Haze	logHaze, an expanded scale of haze measurement. Further details of Haze test methods and logHaze can be found in the **Appearance Theory** section of this manual.

With ASTM E430 selected an (E) identifier will be displayed next to the Hz parameter.

```
┌─────────────────────────────────────┐
│ Gloss + IQ              ▐████  ▏ ↘  │
├─────────────────────────────────────┤
│ ◄↺▼ MENU ▲CURVE ►                   │
│ ┌─────────────────────────────────┐ │
│ │            20º                  │ │
│ └─────────────────────────────────┘ │
│            88.2                      │
│ ┌─────────────────────────────────┐ │
│ │  RIQ     logHaze C     Rspec    │ │
│ └─────────────────────────────────┘ │
│  96.0       1.6         73.0        │
│                  26/10/23    16:41   │
└─────────────────────────────────────┘
```
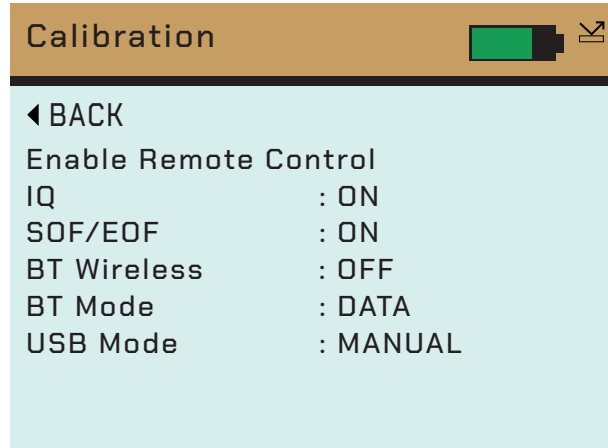
| Haze Compensation | ON. Further details of Haze Compensation can be found in the **Appearance Theory** section of this manual. |

Press the ⦂ Left button to return to the **Home screen**.

Note – The Pass / Fail option is not available when DOI / RIQ are selected.

Control Screen

```
Calibration                    [====]  ↘

◀ BACK
Enable Remote Control
IQ                  : ON
SOF/EOF             : ON
BT Wireless         : OFF
BT Mode             : DATA
USB Mode            : MANUAL
```

The **Control Screen** is used to configure the instruments Bluetooth parameters to the user's preference. Press the ⬡ **Up / Down** buttons to navigate through the options, press the ⬡ **Enter** button to select the option required.

Settings in the Control screen are:

ID	Measurement definition header
SOF/EOF	Start / End of file markers for use in analysis software
BT Wireless	Enables or disables Bluetooth
BT Mode	Set the functionality of Bluetooth:
	RC (Remote Control) - Operate and receive data via Bluetooth.
	Data – Only receive data via Bluetooth.
USB Mode	Set the functionality of the USB connection when connected to a PC.
	Charge – Charge the instrument via USB (note the instrument can be operated during this time but cannot be used to make measurements).

Manual – Allow the functionality to be set on the instrument each time a connection is made.

RC – Remotely control the instrument via USB to make measurements and transfer data.

Data – Data only mode.

Press the ⚫ Left button to return to the **Home screen**.

Bluetooth Communication and Pairing

The Rhopoint Detailometer has a **Bluetooth** function that allows readings to be instantly transmitted to a compatible PC.

20/60/85° Gloss, Log Haze, DOI/RIQ, RSPEC, Goniophotometric information, instrument serial number and service/calibration data can be instantly accessed by many PC applications including Excel, Word, Wordpad, OpenOffice or SPC packages.

Pairing Procedure

Switch on the Rhopoint Detailometer.

The **Bluetooth icon** must be visible to allow pairing.
The Detailometer can now be connected to the **App** for easy transfer of readings.
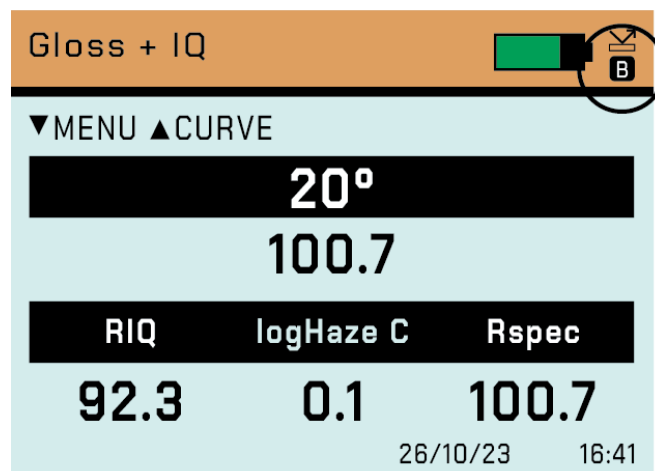
Connectivity to Rhopoint Quick Report

The Detailometer can be connected to the **Rhopoint Quick Report App**.
This will quickly and easily create a professional detailed report of a vehicle paint work.

The App is available on IOS, Chrome and Android. Further details on using the **Quick Report App** are detailed in the **App Manual**.

Instrument Setup Screen

```
Instrument Setup          [====]  ⌄

◀ BACK
Language            : GB
Screen View         : Normal
Backlight           : 100%
Power Off           : 50 Min
Power Switch        : ON ONLY
SOUND               : ON
USB Charge          : 500mA
Set Date & Time
```

The **Instrument Setup screen** is used to configure the instruments basic operating environment to the user's preference.

Press the ⊕ **Up / Down** buttons navigate through the options, press the ⊕ **Enter** button to select the option required.

Settings in the **Instrument Setup screen** are:

Language   Set instrument language to English (default), Spanish, German, Chinese, Japanese or French.

Screen View   Set the orientation of the screen to **NORMAL** or **INVERTED**

Backlight   Set screen intensity to either 20%, 40%, 60%, 80% or 100% brightness

Power Off   Set instrument to automatically power off after either 30sec, 60sec, 90 sec or 120 sec of inactivity or DISABLE this feature

Power Switch   Set the functionality of the Power Switch:

ON ONLY   Switch the instrument **ON** only.

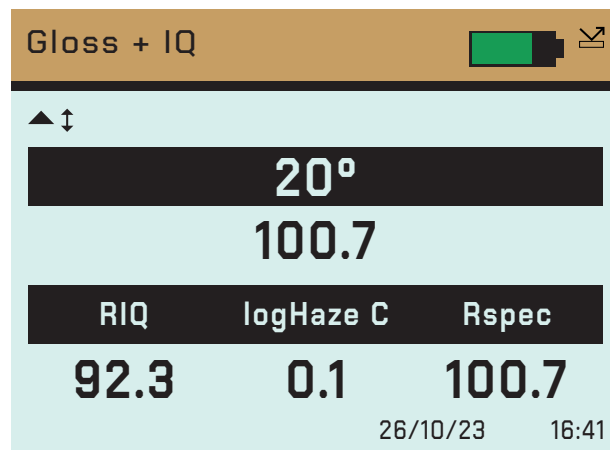**ON & OFF**   Switch the instrument **ON** and **OFF**.

ON (Fn)   Enable **Function Select** mode. Selecting the PowerSwitch to **Function Select** mode provides easy access to regularly used feature, **Rotate Screen**.

ON (•)   Use as an ⊕ **Measure / Enter** button.

ON (Fn)   In the **Home screen**, press and hold the ⏻ **On / Off** button, the display will change as shown below:

```
Gloss + IQ                    [████]  ⊻
▲↕
            20º
            100.7
    RIQ      logHaze C      Rspec
    92.3       0.1          100.7
                      26/10/23    16:41
```

Press the ⊕ **Up** button to rotate the screen. Only one rotation is possible each time the ⏻ **On / Off** button is pressed.

Press the ⊕ **Down** button to start a new batch, this action is either confirmed or cancelled by selecting the required box when prompted using the ⊕ **Left / Right** buttons and pressing the ⊕ **Enter** button.

Sound	Enable or disable button press sound
USB Charge	Set the USB charge current to either 500mA or 100/500mA
Set Date & Time	Set the date and time on the instrument.

Press the ⊕ **Down** button to set time.

Press the ⊕ **Left / Right** buttons to select the date or time and the ⊕ **Up / Down** buttons to increment / decrement the value.

Press the ⊕ **Enter** button again to save the value.

Press the ⊕ **Left** button to return to the **Home screen.**

Maintenance Screen

The **Maintenance screen** is used by Rhopoint Approved Service Centres. It is PIN locked to prevented unauthorised access.

About Screen

```
Instrument Setup          [====] ⤓

◄ BACK              © 2010-2023
Rhopoint Instruments Ltd
Serial Number    : 1234567
Firmware Version : 5.01
Scanner Version  : 180906
Factory Cal.     : 2023-07-20
Battery Voltage  : 3.57V
USB Charge       : OFF
```
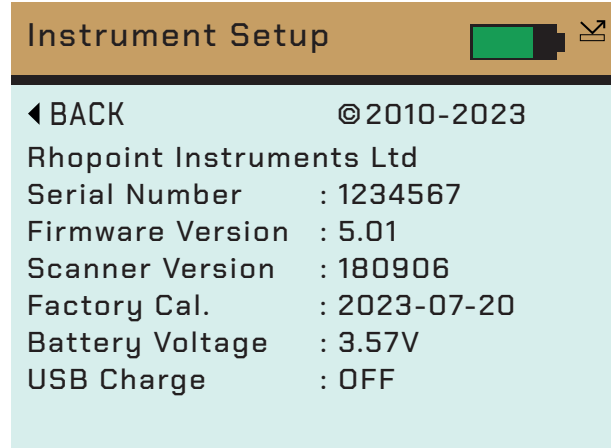
The **About screen** is for information only.

It provides information relating to the instrument's software, the instrument serial number and last date of Factory Calibration.

It also shows the amount of free memory available and battery power status. Press the **Left** button to return to the **home screen**.

Appearance Theory

Rhopoint Detailometer Glossmeter & Goniophotometer

Goniophotometer is derived from Greek;

Gonio – Angle

Phos – Light

Metron - Measure

Gloss describes the perception of a surface appearing "shiny" when light is reflected from it.

When viewing glossy surfaces, it is found that a sudden increase in brightness occurs when the angle of observation equals the angle of incidence of the illuminating light. This condition is termed as specular reflection.

A glossmeter is used to quantify the amount of light reflected from a surface.

At 20° the Rhopoint Detailometer uses a diode array to measure the distribution of reflected light +/- 7.25° from the specular reflection angle in steps of 0.02832°.

This technology allows the instrument to calculate Gloss, Haze, Distinctness of Image, Reflected Image Quality and RSpec. These parameters inform the user not just how reflective the surface is but also provide information about its image-forming qualities and smoothness of the finish.

These values are used to assess the visual impact and reflective quality of many coated, painted and polished surfaces.

Why is reflected appearance important?

A crucial factor in assessing the appearance of any manufactured product is the "glossiness" of its finish.

Gloss finishes are often used make products visually appealing. Highly reflective, extremely smooth finishes are used to enhance the aesthetics of cars, luxury yachts and high-end consumer electronics. Matt finishes are used for contrast or on furniture and architectural features.

Whilst gloss measurement is the most widely used technique to assess reflective qualities, it is not sensitive to surface textures which reduce perceived quality. This means that surfaces can often have identical gloss values but have very different visual appearance.

The Detailometer measures standard gloss within existing standards and uses new technology to examine in more detail the distribution effect which reduces perceived quality.

The instrument provides goniophotometric profiles, gloss, haze and distinctness of image values which can be used to assess the visual qualities of any product.

As well as assessing the visual impact of a surface, the Detailometer can also be used to identify problems associated with coating formulation and application.

Coating problems such as dry spray, orange peel, poorly dispersed or flocculated pigments, micro bubbles, resin incompatibilities and additive migration all results in reduced DOI, Haze or gloss values and therefore can be measured with this instrument.
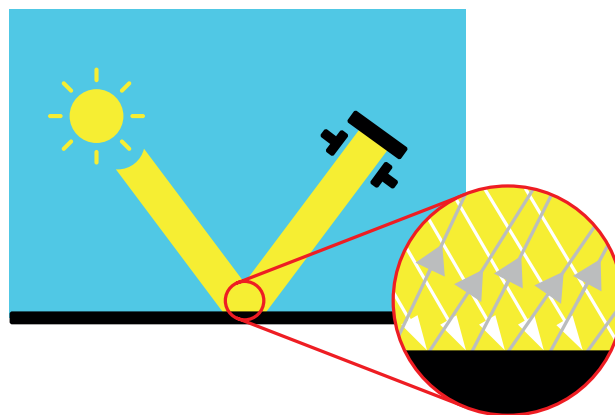
Specular reflectance from a "perfect mirror" surface - all light is reflected in the specular direction.

Gloss

Gloss is the visual sensation associated with the brightness of direct light reflected in a surface. Surfaces with high reflectance are determined as glossy; less reflective surfaces are semi-gloss or matt.

Glossmeters quantify this effect by measuring light reflection from a sample at defined angles.

The Gloss Unit (GU) is defined in international standards including ISO 2813 and ASTM D523. It is determined by the amount of reflected light from a glass standard of known refractive index.

Calibration tiles supplied with Rhopoint instruments are traceable to master glass standards held at NIST (Canada).

Measuring Gloss with the Rhopoint Detailometer

The Detailometer is supplied with a certified glass calibration tile traceable to a NIST reference standard.

At 20° the Detailometer uses a diode array which measures the distribution of reflected light 12.75° – 27.25°.

The instrument does not have physical receiver apertures like a conventional glossmeter; the 20° gloss value is obtained by measuring with elements of the array which correspond to the angles specified in the standards.

% Reflectance

Materials having a high refractive index such as clear plastics and varnishes can typically have measurement values that exceed 100GU due to multiple reflections occurring within the material. Highly reflective metals can also produce gloss values up to 2000GU. In these cases, it is common not to report values in GU but to express them in terms of percentage Reflectance.

% Reflectance therefore compares the amount of light energy transmitted and received by a gloss meter and expresses the value as a percentage of the measurement angles full range.

Gloss (GU) measurement range: 20°: 0 – 2000GU.

The measurement mode is a simple conversion of gloss value to percentage reflectance.

   20 degree - 2000GU = 100% reflectance

So, 20 degree - 1000GU = 50% reflectance, 500GU =25% etc.

When the Detailometer is calibrated in this mode it will calibrate to the GU value but will still display % reflectance.
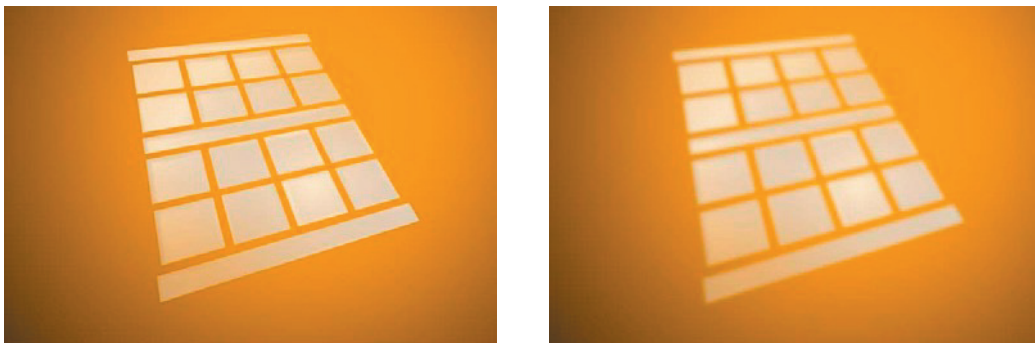
Haze

**Haze** describes the milky halo or bloom seen on the surface of high gloss surfaces.

Surface haze can be problematic in most coating applications including automotive manufacture, powder coatings and other high gloss coatings. It can be attributed to a number of causes including incompatible materials in a formulation, poor dispersion and problems encountered during drying/curing/stoving.

Coatings without haze can be seen to have a deep reflection and have high reflected contrast. Those with haze exhibit a slight "milky" finish which can be seen over the highly glossy surface.

Haze is caused by microscopic surface texture which diffuses light adjacent to the main component of the reflected light.

When viewing the reflection of a strong light source in a surface with high haze the image "blooms" and has a bright halo around it.
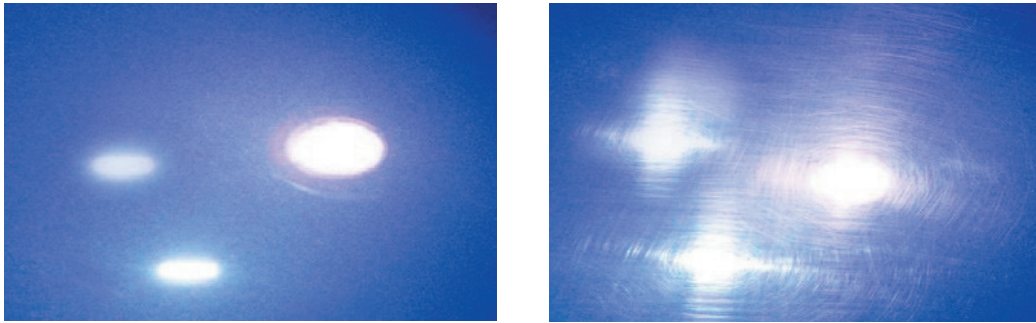
Haze is an important measure for highly polished metals and is often associated with polishing marks and machining direction.

Gloss-haze meters are traditionally used to measure this parameter and use a standard glossmeter design with additional light stops and diodes to measure the haze component 2° either side of the specular component.

Measuring Haze with the Rhopoint Detailometer

Taking reliable readings with a traditional gloss-haze meter can be difficult as the sample surface needs to be completely flat and un-textured.

The Rhopoint Detailometer automatically compensates for sample surface flatness and texturing allowing haze measurements to be taken on a much wider range of product surfaces.

A high gloss surface with zero haze has a deep reflection image with high contrast.

Log Haze Values are commonly quoted for paints and coatings as this scale has better corroboration with human perception of surface quality.

Haze Compensation

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.
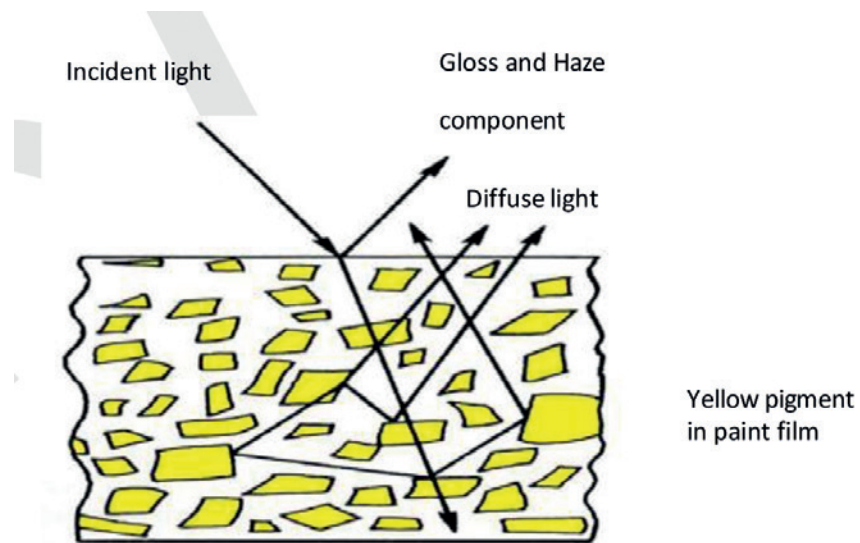
The Rhopoint Detailometer compensates for reflection from within the coating for highly reflective pigments, metallic coatings and speciality pigments, allowing the haze of any painted surface to be measured.
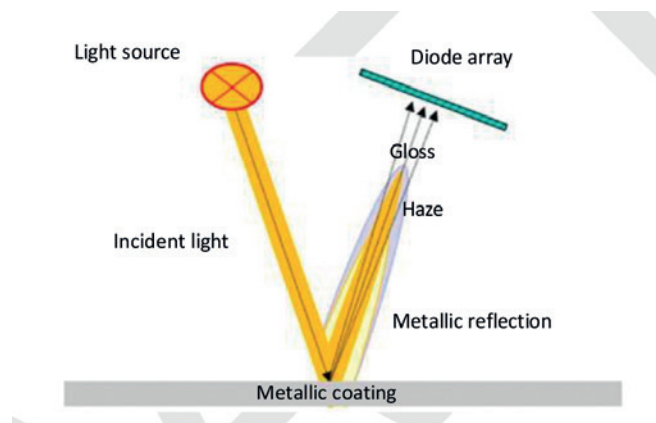
Corrected Haze Measurement on Metallic Coatings

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 measured independent of their colour.

Conventional gloss-haze meters do not work correctly on metallic coatings as metallic flake within the coating reflects the light directionally around the specular angle. As little or no metallic reflection is present at the angle at which the luminosity is measured, metallic coatings and speciality pigments have an unexpectedly high haze reading.

The Rhopoint Detailometer 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

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

Distinctness Of Image (DOI)

Distinctness Of Image is, as the name implies a function of the sharpness of a reflected image in a coating surface.

Two surfaces finished with similar coatings may exhibit identical gloss values but visually the quality of one coating can be seen to be very poor. Upon closer inspection the visually substandard poor coating has a highly textured dimpled appearance known as "orange peel". When a reflected object is viewed in such a coating the image becomes fuzzy and distorted.

Orange peel, waviness, texturing, pin holing and similar effects can be problematic in many high gloss coating applications including automotive, powder coating and any other industries that requires a smooth homogeneous finish. All these effects can be measured with the Rhopoint Detailometer.

DOI has been measured instrumentally and subjectively in the automotive industry for many years. Instruments that measured this value in the past were bulky expensive and some had poor repeatability. DOI measurement was not common outside of automotive because of the cost of equipment was high and the demand for high quality gloss finish was not as crucial.

The Detailometer measures the DOI of a surface by quantifying the way a reflected measurement beam is spread and distorted around the specular angle.
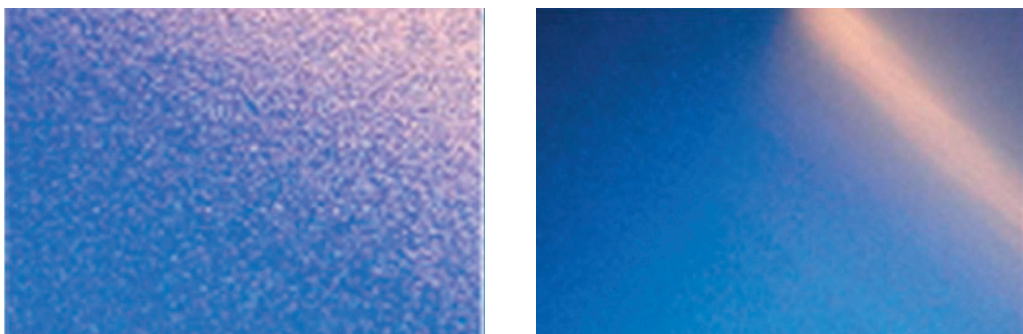
Example test panels with low and high DOI values. Orange peel, texture, flow out and other key parameters can be assessed in coating applications where high gloss quality is becoming increasingly important.

The DOI value of a surface is a number between zero and one hundred; a surface that exhibits a perfect undistorted image returns a value of 100, as the value decreases the image becomes less discernible.

Reflected Image Quality (RIQ)

Reflected Image Quality is a new measurement developed by Rhopoint Instruments to provide greater sensitivity when evaluating highly reflective coatings and the specular / diffuse element of lower gloss materials.

Two highly reflective surfaces that have very small changes in orange peel or texture will show very little or no change in DOI due to the way that it is calculated but will appear quite different visually.

By reducing the sensing distance around the specular angle and measuring the reflected light and distortion around it, a much higher resolution response is achieved with greater linearity, more in line with the visual experience.

Two highly reflective panels with the same gloss values show little change in DOI but appear different.

Similarly, for lower gloss materials due to the smaller sensing distance, this measurement allows improved differentiation of the specular and diffuse elements of reflectance from the surface. As this sensing distance only allows the measurement of the amount of truly reflected light in the specular direction it is far more directionally selective.
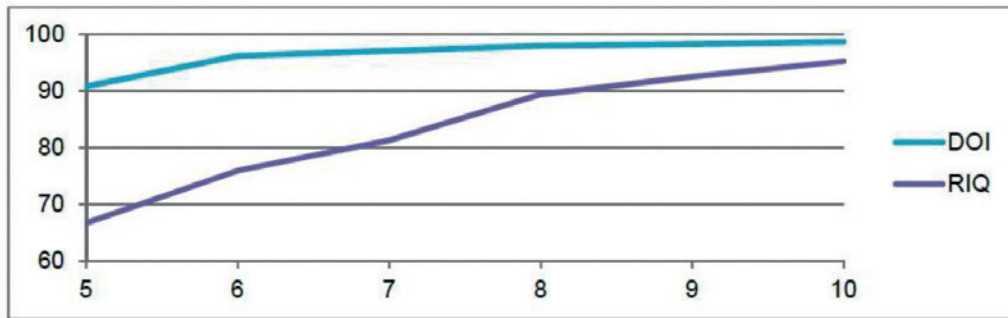
*Average measurement of ACT panels 5 - 10 show little variation when using DOI.*

However when using RIQ a greater differentiation is achieved.

The RIQ value of a surface is also a number between zero and one hundred; a surface that exhibits a perfect undistorted image returns a value of 100, as the values decrease higher surface texture is present and the image sharpness reduced.

RSpec- Peak Specular Reflectance

RSpec is the peak reflectance measured over a very narrow angle in the specular direction (+/-) 0.0991°.
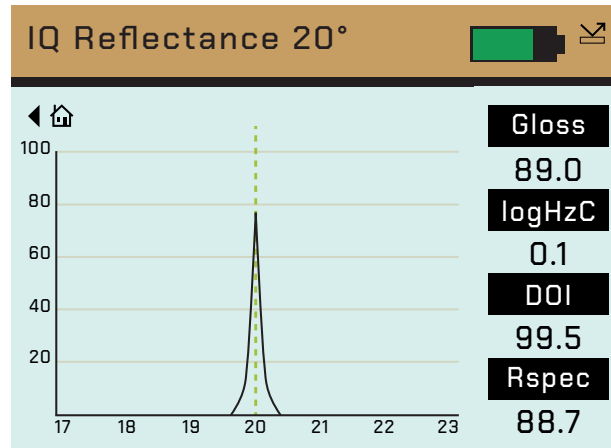
RSpec is very sensitive to any surface texture. Waviness or rippling on a surface acts as a concave or convex reflector deflecting light around the specular angle. When Rspec is equal to the gloss the surface is smooth. RSpec drops as texture becomes apparent.
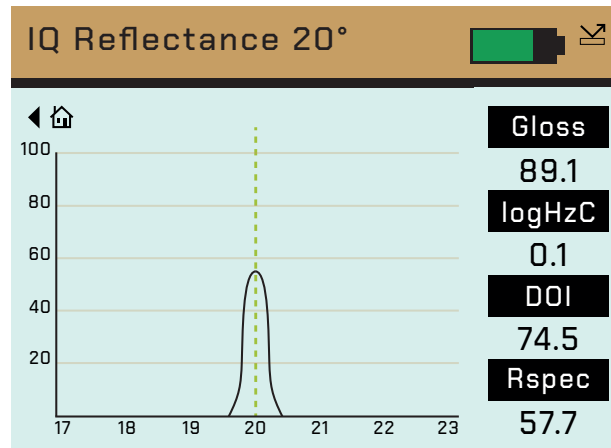
The same paint applied to two panels, the second system has orange peel / waviness which is due to incorrect application setting on spray gun. RSPEC is shown by the red line.

At 20° the Detailometer automatically compensates for curved samples or a sample measurement position that is not completely in contact with the base of the instrument. Either of these effects will cause readings errors using a standard glossmeter.

To overcome this the Detailometer scans the reflectance profile of the surface from 12.75° - 27.25° and identifies the angular position of RSPEC.

Gloss, Haze, DOI and RIQ values are then calculated using the RSPEC angular position as the 20° reference point.

Goniophotometric Profile

The Gloss, Haze, DOI, RIQ and RSpec values produced by the Detailometer can be used to assess the visual quality of any surface. Alternatively, if required, the full Goniophotometric curves can be downloaded to PC for a detailed understanding of specular reflectance.
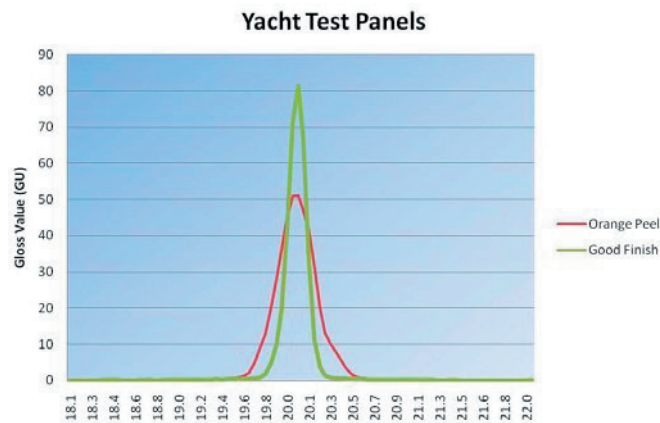
Sample	Orange Peel	Good Finish
Angle	20.0	20.0
Gloss	87.2	89.0
Rspec	54.7	88.2
Log Haze	37.6	32.5
DOI	84.3	97.1

This example perfectly demonstrates the need for additional appearance information than that supplied with a glossmeter, as the panels have virtually identical gloss when measured with this instrument. Visual inspection however, shows that the first panel has a very high degree of orange peel.

When measured with the Detailometer, the instrument measures gloss identically to a standard glossmeter (87.2 GU- 89.0 GU). It also quantifies the orange peel finish on the substandard coating with a low DOI reading of 84.3.

Calculating Gloss, Haze, RSpec and DOI from a Goniophotometric Profile

For the above example at 20°, the Rhopoint Detailometer calculates the **Gloss value** by summing the gloss values +/- 0.9° from the specular angle. These methods / tolerances are specified in ASTM D523/ISO 2813.

The **RSpec value** is the peak gloss value at the specular angle, 20° (+/-) 0.09905°.

Haze is measured by summing the gloss values between 17.2-19° and 21-22.8°.

The **DOI value** is a function of the slope of each curve, the sharper the gloss response, the higher the DOI value (100 DOI is a perfect reflecting surface).