

HORIBA

Explore the future

Integrated type
IG-320



CE marking compliant

Handheld Gloss Meter **GLOSS CHECKER**

IG Series

USER GUIDE



Remote sensor type
IG-331

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Explore the future

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Quantify Gloss with HORIBA Gloss Checkers!

Ideal for quality control of surface finishes

The feel and appearance of a product have major impact on its sales in today's market. HORIBA Gloss Checkers provide an easy-to-use and an objective way of inspecting surface luster, eliminating ambiguity of subjective observations. HORIBA Gloss Checkers give numerical value to glossiness, which can be utilized in quality control and process benchmarks. Compact, light and simple to use, HORIBA Gloss Checkers are ideal for measuring Gloss in a wide range of applications.

Evaluate surface finishes and coating effectiveness.



Advantages of HORIBA Gloss Checkers IG Series

HORIBA Gloss Checkers employ a proprietary system, which give the following advantages.

1 Near Infrared LED light source

The near Infrared LED light source does not require warm-up so saves time and power. The service life is extremely long, making it maintenance-free and cost effective. Its pulsating emission makes it less susceptible to changing ambient light conditions.

(LED Wavelength of IG331: 890nm, IG320: 880nm)

2 Compact optical system

By miniaturizing the optical components the HORIBA gloss checkers have become much smaller and lightweight. The optical components are mounted in such a way to improve their resistance to vibration and avoid the requirement for optical axis adjustment.

3 Simple operation

A single key operation to Calibrate and measure, HORIBA Gloss Checkers can be used by anyone and do not require any expert skill or specialist knowledge to operate.

4 Low prices

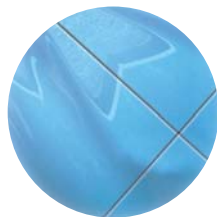
The HORIBA proprietary system makes it amazingly affordable. The low cost has made HORIBA Gloss Checkers the standard in many industries.



What is GLOSS?

Most of us have tried to appraise gloss at one time in our lives when we wax cars, polish furniture and floors. Gloss is the quality of a surface to cause specular reflection, and is also described as luster, shine, sheen and others. It is often a subjective impression and depends on the mood and senses of an observer.

The most common method of measuring gloss has been standardized and approved by organizations such as Japanese Industrial Standards (JIS).



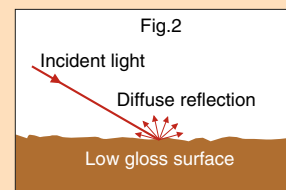
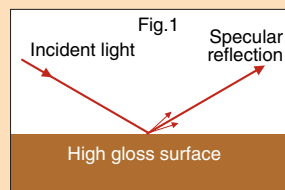
Reference

Measurement of Specular Reflection

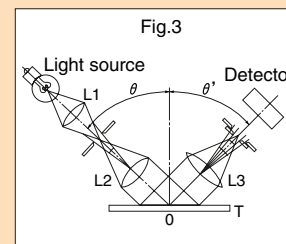
When light shines on an object, some part of it is reflected, refracted or absorbed. There are basically two ways in which the light reflects off a surface, specular and diffuse reflections.

- 1) **Specular reflection is the mirror-like reflection in which incident angle is identical to reflection angle in respect to surface normal.**
- 2) **Diffuse reflection is the matte reflection in which incident light is reflected in a broad range of scattered angles.**

A sheet of glass or polished metal surface gives more specular reflection and less diffuse reflection as in Fig.1. We often describe such surface as having high gloss. A sheet of frosted glass or cardboard gives less specular reflection and more diffuse reflection as in Fig.2. We perceive such a surface to be matte or dull.



HORIBA Gloss Checkers utilize this property to measure gloss and have the basic structure described in Fig.3. The detector measures incident rays emitted at an angle and reflected of the surface T. The light source



is placed at the focal distance of the lens L2 to emit parallel rays on the sample surface. Reflected rays off the surface T pass Lens 3, focused at the opening, and are captured by the detector behind it. The incident angles can be set at 5 different angles of 20°, 45°, 60°, 75° and 85° to suit different surface conditions. Standard setting of incident angle for most applications is 60°.

IG-331

Choice of measurement angle at 60° or 20°
Convenient remote sensor type



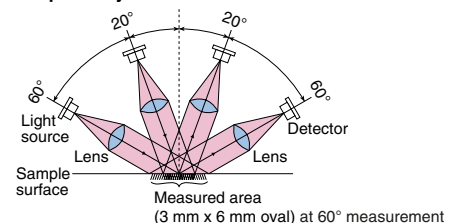
Measurement

<p>1 Press "ON".</p>	
<p>2 Remove the protective cover.</p>	
<p>3 Place the sensor unit directly on the surface to be measured, leaving no gap, and gently press on the sensor aim marking.</p>	
<p>4 Read the value shown on the display. Press "Hold" to retain readout, pressing "Hold" again will release it.</p>	
<p>5 Press "OFF" when finished. The automatic power-off function will activate after 5 idle minutes.</p>	

Calibration

<p>1 Attach the protective cover.</p>	
<p>2 Place the sensor unit on a flat surface and gently press on the sensor aim marking.</p>	
<p>3 Press "CAL" for few seconds while the power is on. The display will show "CAL". The unit will automatically revert to measurement mode after successful calibration.</p>	
<p>4 Values within ± 1 of calibration figure, marked on the back of the protective cover, are satisfactory. Use clean dry cloth to wipe off any dirt or smear from the protective cover.</p>	

Optical System

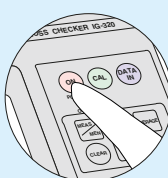



IG-320

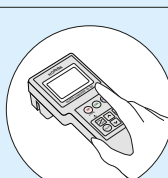
Data memory and instant averaging functions High precision integrated type

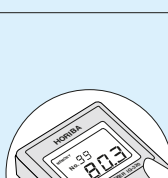


Measurement

- 

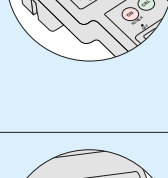
1 Press "ON".
- 

2 Remove the protective cover.
- 

3 Place it gently on the surface to be measured.
- 

4 Read the value shown on the display.


Press "Data input" to store the readout in memory. (Up to 99 readings are memorized along with the respective data number.)

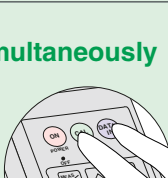
Pressing "Average" can instantly display the average of memorized readings when 3 or more readings are stored in the memory.
- 

5 Press "OFF" when finished.

The automatic power-off function will activate after 5 idle minutes.

Calibration

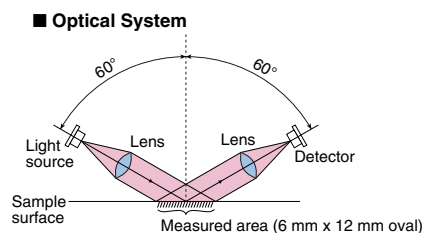
- 

1 Attach the protective cover.
- 

2 Press "CAL" and "DATA IN" simultaneously while the power is on.

The calibration is successful, if the display shows the preset calibration value after showing "CAL".

Use clean dry cloth to wipe off any dirt or smear from the protective cover.





Remote sensor type

Integrated type

IG-331

IG-320

Optical system	60° measurement	Incident angle 60° Reception angle 60°		
	20° measurement	Incident angle 20° Reception angle 20°	—	
Measuring area	60° measurement	3 x 6 mm oval	6 x 12 mm oval	
	20° measurement	3 x 4 mm oval	—	
Light source		LED (wavelength: 890 nm)	LED (wavelength: 880 nm)	
Light source service life		Indefinite		
Detector		SPD (silicone photodiode)		
Measuring range		0-100		
Display range		0-199 (resolution: 1)	0-199.0 (resolution: 0.1)	
Reproducibility		±5% F.S. ±1 digit (60° measurement)	±0.5% F.S. ±1 digit	
Power source		A3 dry-cell battery x 4	S-006P dry battery (9VDC) for operation, CR-2025 lithium battery (3VDC) for memory	
Continued use time		50 hours or more	15 hours or more	
Ambient conditions		10-40°C	0-40°C	
Dimensions		Main body: 140 (W) x 75 (H) x 34 (D) mm 5.5 (W) x 3.0 (H) x 1.3 (D) in Optical system: 88 (W) x 30 (H) x 45 (H) mm 3.5 (W) x 1.2 (H) x 1.8 (H) in	78 (W) x 189 (H) x 58 (D) mm 3.1 (W) x 7.4 (H) x 2.3 (D) in	
Mass		Approx. 350g (with battery)	Approx. 400g (with battery)	
Additional Functions		Automatic calibration		
		Automatic power cut-off		
		Display hold		
		Overrange display		
		Battery life display	Battery alarm	
		—	Built-in data memory (max. 99)	
		—	Computation of averages	
		—	Keystroke confirming tone	

Major differences between IG-331 and IG-320

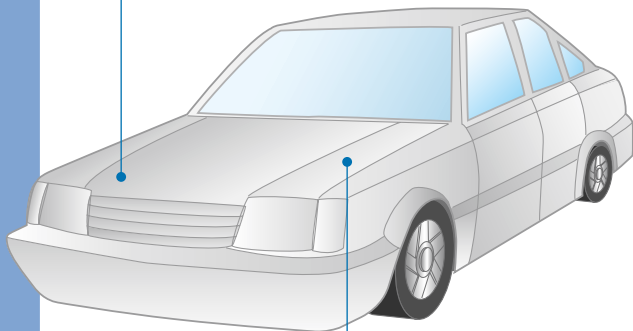
Note: Use the 20° measurement mode of the IG-331 when the gloss value in the 60° measurement mode exceeds 70.

[Accessory] Protective cap (with standard surface for calibration)
IG-331 Part Number: 90820005000 IG-320 Part Number: 90820001000

Applications

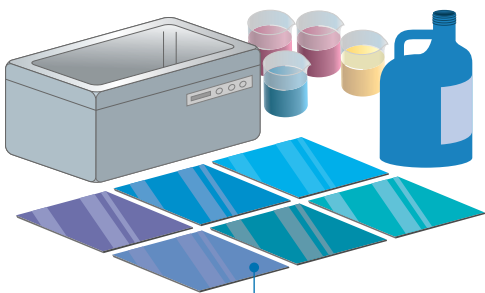
Inspection of paint protection and waxing

HORIBA Gloss Checkers are used as a part of regular auto maintenance to check for wear of protective coating.



Auto-body paint inspection

HORIBA Gloss Checkers are ideal for checking touch-up finishes.



Evaluation of detergents and washers

HORIBA Gloss Checkers are used to determine and compare performance of detergents and washers.

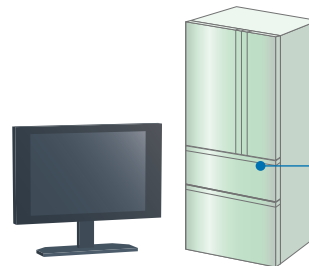
Masonry and building exteriors

HORIBA Gloss Checkers are handy when assuring uniform finish when using stone, wood, concrete, aluminum sashes and other materials.



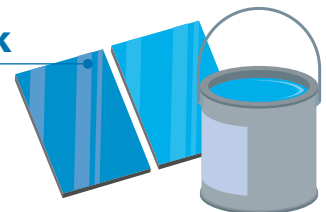
Surface inspection of plastic molding

Appearance check and weathering test.



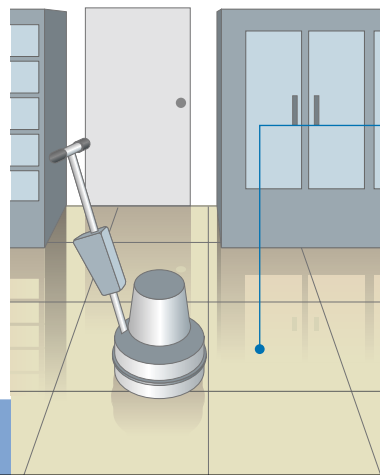
Coating and ink

Quality control, exposure tests and gloss inspection.

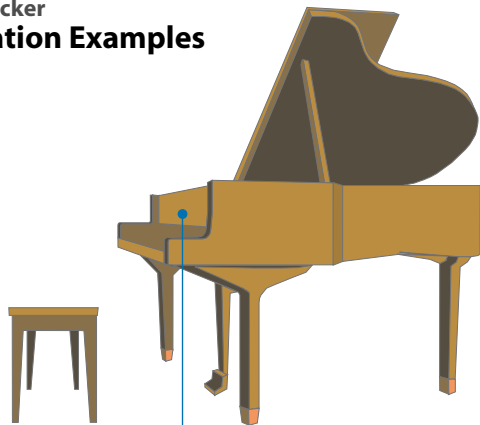


Floor maintenance

Clean look of a polished floor and high gloss can affect customer impression.



Application Examples

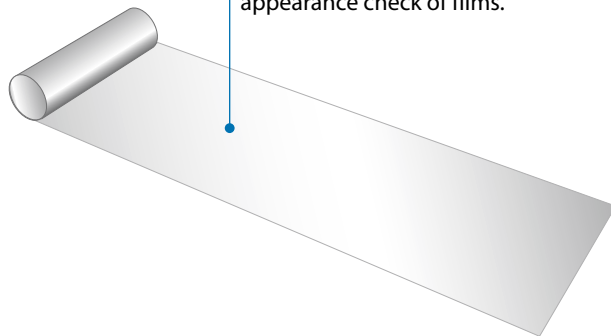


Lacquered or resin coated wood surfaces

Finish inspection, deterioration check and gloss check of furniture or other wooden objects.

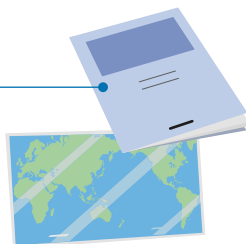
Film

R&D, quality inspection and appearance check of films.



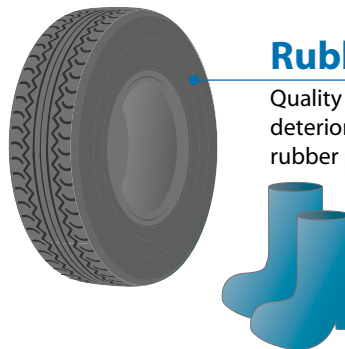
Printed matter

Evaluation of varnishing and other beautification process (lamination, coated paper etc), curing uniformity, and paper surface condition.



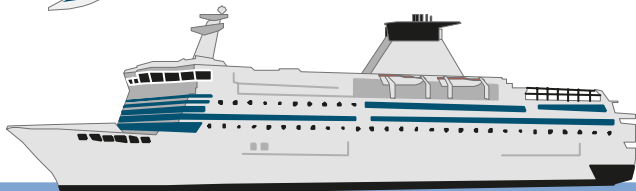
Rubber

Quality inspection and deterioration check of rubber products.



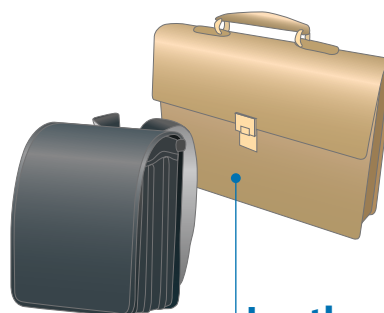
Inspection of painted surface

Exterior surface inspection and deterioration tests of vehicles, ships, airplanes, bridges, steel framing, billboards, steel towers and more.



Leather

Inspection of leather products and evaluation of leather cleaners and waxes.



Sample Measurements

Variations in reflection due to different surface conditions

Values displayed by the HORIBA Gloss Checkers have strong correlation to reflections at the sample surface.

The property of reflective light depends on the structure and surface conditions (grain, refractive index, etc).

It is important to understand surface characteristics of various materials when using HORIBA Gloss Checkers.

The following are some examples of different materials and their properties.

Glass

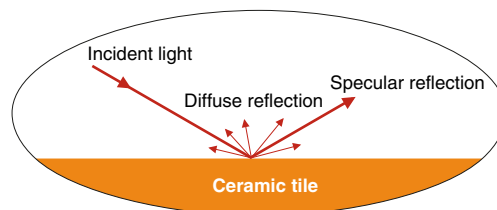
Measurable gloss of a flat glass surface with optical polish depends solely on the refractive index of that glass as shown in the table below. Provisions such as making the glass thicker, applying matte black coat and/or giving a wedge-shaped cross-section become necessary when measuring a transparent glass sample, in order to prevent reflections off the back surface from interfering with the measurements.

Specular reflection angle 60°

Refractive index	Reflection coefficient	Glossiness
1.505	9.00	90.0
1.510	9.08	90.8
1.515	9.17	91.6
1.520	9.25	92.4
1.525	9.33	93.2
1.530	9.41	94.1
1.535	9.49	94.9
1.540	9.57	95.7
1.545	9.65	96.5
1.550	9.73	97.3
1.555	9.81	98.1
1.560	9.89	98.9
1.565	9.97	99.7
1.570	10.05	100.5
1.575	10.13	101.3
1.580	10.21	102.1
1.585	10.29	102.8
1.590	10.37	103.6
1.595	10.45	104.4
1.600	10.52	105.2

Ceramic tile

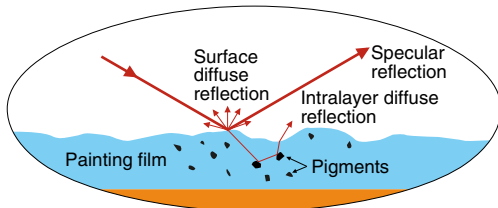
The figure below shows how light reflects off a ceramic tile. Most light bounces off the surface as diffuse reflection and specular reflection, and no light penetrates the surface. Both diffuse reflection and specular reflection are independent of light absorbing characteristic and therefore the color of ceramic tiles has almost no effect on measurements. A ceramic tile retains a stable and uniform surface condition. It is often used as the secondary standard for this reason, covering midrange glossiness not well represented by the primary standard made of glass.



Painted surface

The figure below shows how light reflects off a coated surface. Incident light is separated into

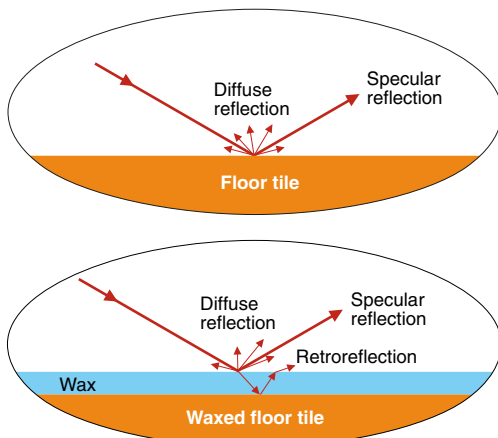
- 1) Specular reflection at the coating surface,
- 2) Scattered diffuse reflection due to coating surface imperfections and
- 3) Random diffuse reflection off pigments below the coating surface.



The first 2 types of reflection are independent of the paint color and its absorbing property and depend on the refraction index and surface uniformity. Intralayer diffuse reflection, on the other hand, is subject to absorption and the color, brightness, and other properties have effects. This complexity of any painted surface makes it important to consider the tone and clarity of specular reflection and not just its intensity.

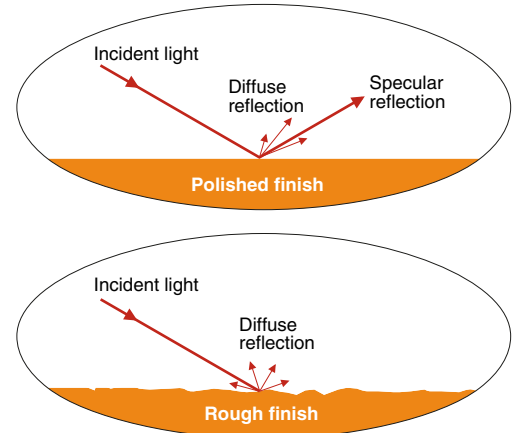
Floor tile

Office and store floors are periodically cleaned and waxed to maintain beauty. But visually assessing how clean the floor leaves room for ambiguity. Horiba Gloss Checkers are being widely used as a tool to provide objective, more scientific means to floor maintenance. The figures below describe reflection off floor tiles.



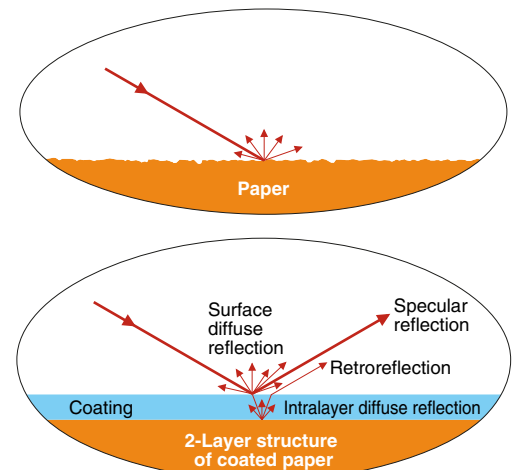
Masonry

Stone does not pass much light and the reflection depends on the surface coarseness. For this reason, HORIBA Gloss Checkers are used to measure surface finish, polish, scratch and corrosion besides glossiness.



Paper

Papers typically have a simple single layer structure as in the figure below, but coated paper such as high gloss-paper have a 2-layer structure having a complex reflection pattern. Some paper with very high retroreflection and/or intralayer diffuse reflection properties gives counterintuitive readings. Thickness and material of the coating affects measurement also; however, HORIBA Gloss Checkers have high data reproducibility and stability. They can be used to detect irregularities of the same paper type or in finding deviations from a standard.



Q & A

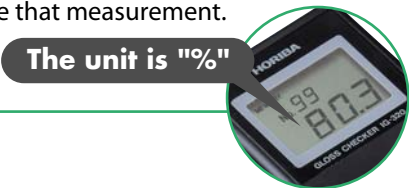
Q Is it difficult to use?

A No. Turn HORIBA Gloss Checkers on and simply place it on the surface you wish to measure. The compact and lightweight design is easy for anyone to use. It can speed up the inspection process.



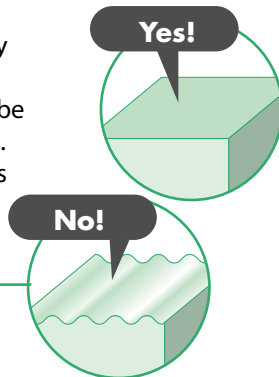
Q What is the unit for gloss?

A The percentage symbol is a widely used unit for gloss. A measurement value is usually recorded along the incident angle, make and model number of the gloss meter used to take that measurement.



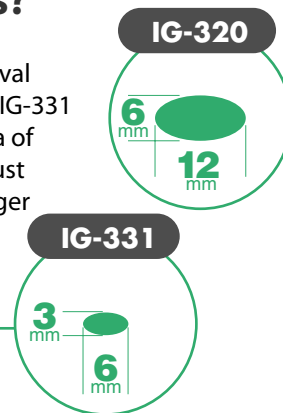
Q Is there anything that cannot be measured?

A A polished metal with very high gloss cannot be measured. The surface to be measured needs to be flat. Curved or uneven surfaces cannot be measured.



Q Can you measure small objects?

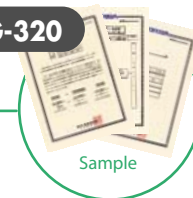
A IG-320 measures an oval area of 6x12mm, and IG-331 measures an oval area of 3x6mm. An object must have a flat surface larger than these to be measured.



Q Do you issue inspection certificates?

A HORIBA will issue an inspection certificate for IG-320 upon requests. This service is not available for IG-331.

Inspection certificate of IG-320



Q & A

Q What is the difference between IG-331 and IG-320?

A Data resolution of IG-320 is 0.1 and 1 for IG-331. The IG-320 comes with additional data memory function capability. (Refer to specifications on P9-10 for details.)

Resolution 0.1



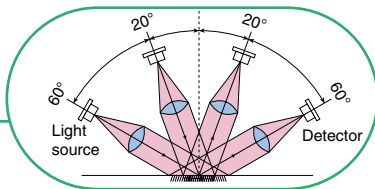
IG-320
IG-331

Resolution 1



Q When do you switch between the 2 incident angles when using IG-331?

A Use 20° for high-gloss objects and use 60° for low-gloss objects.



Q What is the standard used for gloss measurement?

A Gloss of 100% has either 10% reflection coefficient at 60° incident light angle over a glass with a 1.567 refractive index, or 5% reflection coefficient with 20° incident light angle over the same glass.

Q What happens when the measurement is off-scale?

A The word "over" is displayed and the value "199" will flash to show that the measurement is "above 199."



Q Are Gloss Checkers in accordance with JIS Z 8741 standard?

A HORIBA Gloss Checkers use a proprietary design using near-infrared pulse methodology which differs slightly from the JIS standard methodology; however, the measurements are accurate and show a strong correlations with JIS standard figures.

JIS

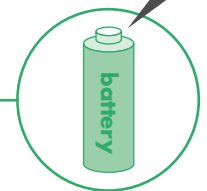
Strong correlations

Gloss Checker

Q How often do I recalibrate?

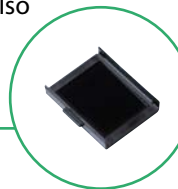
A It is recommended that you calibrate after changing batteries or an extended period of nonuse.

After changing batteries

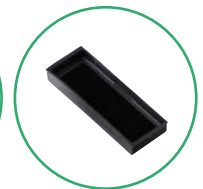


Q What is a standard calibration surface?

A It is a flat piece of plastic that is used for calibration. It is also the instrument's protective cover.



IG-320



IG-331