Gloss Measurement Guide — gloss units, angles, standards and gloss meters

Two panels painted from the same batch can look different only because one is a little more glossy. The eye notices it at once, but cannot put a number on it. This gloss measurement guide explains, in plain terms, what **gloss** and the **gloss unit (GU)** are, how a **gloss meter** measures, which angle to use — **20°, 60°, 85°**, or 45° and 75° for special materials — how to get repeatable results and how to choose an instrument.

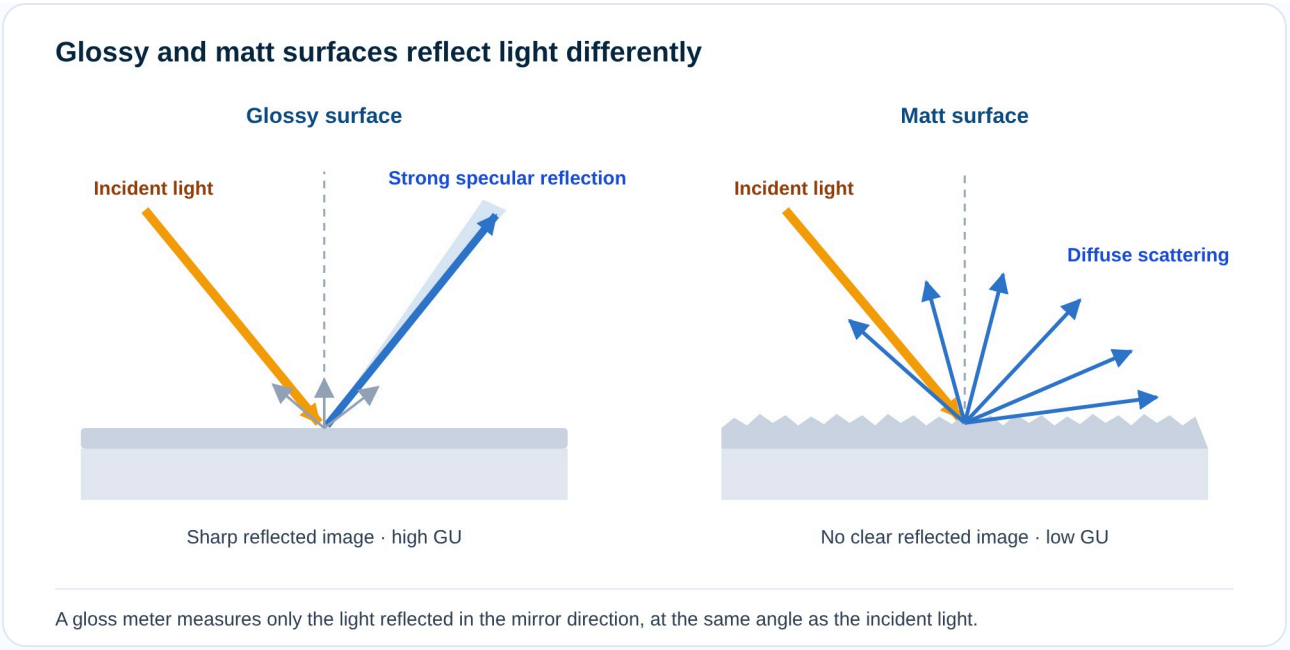
It complements our Colour Measurement Guide and Haze Measurement Guide. Colour, gloss and haze together describe how a surface looks; a specification that controls colour but not gloss leaves a visible gap.

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1 · What gloss is and how it is expressed

Gloss is the ability of a surface to reflect light in the mirror direction — at the same angle on the other side of the normal. A smooth, polished surface sends most of the reflected light in that one direction and shows a sharp reflected image. A rough or matt surface scatters the light in many directions; the reflected image disappears and the surface looks dull.



A glossy surface reflects light mainly in the mirror direction; a matt surface scatters it.

The gloss unit (GU)

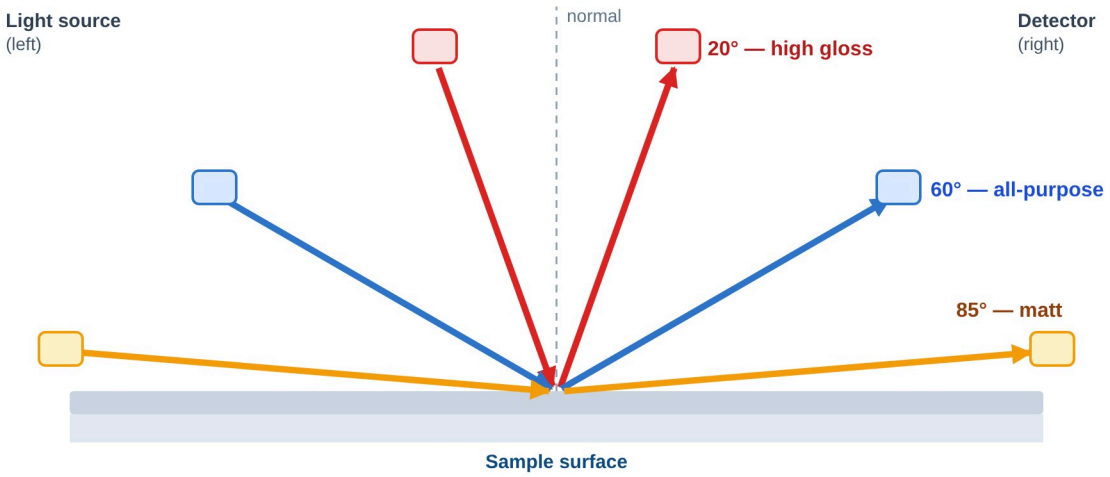
Gloss is expressed in **gloss units (GU)**. The scale is defined by a reference: a highly polished black glass with a specified refractive index is assigned **100 GU** at each measuring angle. A sample that reflects half as much light in the mirror direction as the reference reads 50 GU at that angle.

- **The value always belongs to an angle.** 20 GU at 20° and 20 GU at 60° are different surfaces. Always report the angle: “85 GU at 60°”.
- **Values above 100 GU are normal** for metals, mirrors and metallised films, which reflect more than black glass. Gloss meters for these surfaces measure up to about 2000 GU at 20°.
- **Gloss is not colour.** A black and a white panel with the same surface finish have similar gloss; the gloss meter is designed to respond to surface reflection, not to the pigment.

2 · How a gloss meter measures

A gloss meter directs a defined beam of light onto the sample at a fixed angle and measures, with a detector placed at the mirror angle, how much of it is reflected. Apertures in front of the source and the detector define the beam, so that only specularly reflected light is counted. The instrument compares the reading with its calibration standard and shows the result in GU.

How a gloss meter measures — 20°, 60° and 85° geometry



Angles are measured from the normal. 100 GU = reflection of a polished black glass standard at the same angle.

The three standard geometries. A multi-angle gloss meter has a separate light path for each angle.

Measuring spot

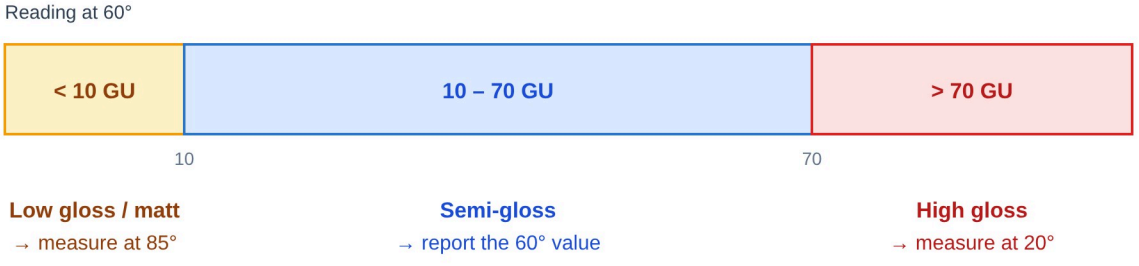
The beam lights an elliptical area on the sample, and the area grows as the angle becomes flatter. On a three-angle meter, typical measuring spots are about 10 × 10 mm at 20°, 9 × 15 mm at 60° and 5 × 36 mm at 85°. A larger spot averages small irregularities; a small spot — for example 2 × 4 mm on CG60M — is needed on curved, narrow or small parts.

Modern gloss meters calibrate on a standard plate stored in the instrument base, measure in about half a second to one second, keep thousands of readings and send data to a PC for reports.

3 · Choosing the angle: 20°, 60° or 85°

Each angle gives the best resolution in one part of the gloss scale. **60°** is the all-purpose angle and the one most specifications quote. **20°** spreads out high-gloss values, where 60° readings crowd together, and **85°** separates matt surfaces, where 60° readings are all close to zero.

Which angle? Measure at 60° first



The selection rule of ISO 2813 and ASTM D523: the angle that gives the best resolution for the gloss level.

Measure at 60° first; the reading tells you which angle gives the best resolution.

Gloss level	60° reading	Angle to report	Typical surfaces
High gloss	> 70 GU	20°	Car body paint, piano lacquer, polished stone and tiles, high-gloss plastics, metal
Semi-gloss	10 – 70 GU	60°	Most industrial coatings, furniture, plastic parts, printed matter
Low gloss / matt	< 10 GU	85°	Matt paints, wall coatings, interior car parts, textured plastics, paper

When the gloss level of a product varies, or when you are not sure, a three-angle meter measures 20°, 60° and 85° in one press and shows all three values together — see CGT268 and CG268. If your products are all in one range and the specification names 60°, a single-angle CG60 is sufficient.

4 · Special angles: 45° and 75°

Some industries use their own angles, set by their standards and by the way their surfaces look in use:

- **45°** — ceramic tiles and sanitary ware, plastic films and some low-to-medium gloss materials. It sits between 20° and 60° and suits surfaces where 60° is too sensitive to small differences in the substrate.
- **75°** — paper and board, coated and uncoated, and printed matter. At this flat angle differences between paper grades become clear, while 60° would read them all as low values.

The dual-angle CG47 measures at 45° and 75°, at one angle or at both together, for ceramics, films and paper.

5 · Standards

Gloss methods agree on the principle and differ in angles and in the materials they are written for. Use the standard your customer or product specification names and state it with the result, for example “gloss 62 GU at 60°, ISO 2813, mean of 5 readings”.

Standard	Angles	Written for
ISO 2813	20°, 60°, 85°	Paints and varnishes — the basic international method
ASTM D523	20°, 60°, 85°	Specular gloss of non-metallic surfaces in general
ASTM D2457	20°, 45°, 60°	Plastic films and solid plastics
ISO 8254-1 / TAPPI T480	75°	Paper and board
ASTM C346	45°	Ceramic materials

CGT268 is built to ISO 2813, ASTM D523 and ASTM D2457; CG268 and CG60 to ISO 2813 and ASTM D523. The texts of the standards are available from ISO and ASTM International.

6 · Measuring in practice

Calibration

- Calibrate on the standard plate supplied with the instrument, at switch-on and whenever temperature changes noticeably. Most instruments recognise the plate in the base and calibrate automatically.
- Keep the plate clean and free of scratches; wipe it only with a soft, lint-free cloth. A dirty plate shifts every reading that follows.
- Have the plate value checked periodically, as your quality system requires.

The sample

- The surface must be clean, dry and flat over the whole measuring spot. Fingerprints and dust lower high-gloss readings noticeably.
- Let fresh coatings cure fully before measuring; gloss can change during drying.
- Place the instrument flat on the sample and hold it still during the reading.



Number of readings and direction

- Measure several positions — typically 3 to 5 — and report the mean; the statistical mode does this for you and also shows the spread.
- On brushed metal, textured plastics, wood and printed surfaces, gloss depends on direction. Measure along and across the texture and agree the direction in the specification.
- Use the continuous mode to move along a large panel and check uniformity.

Small, curved and narrow parts

A standard measuring spot needs a flat area larger than itself. On curved housings, handles, profiles, buttons and fruit, use a small-aperture meter such as CG60M (2 × 4 mm) and compare results only with other small-aperture readings.

Pass / fail

For incoming goods and production, set upper and lower gloss limits in the instrument's QC mode, or in the PC software, so that each reading is judged at once.

7 · Common errors and how to avoid them

Error	Effect	Remedy
Dirty or scratched calibration plate	All readings shifted	Clean the plate, protect it in the base, check it periodically
Sample smaller or more curved than the measuring spot	Readings too low or unstable	Use a smaller aperture or a flat test panel
Comparing values at different angles	Numbers that cannot be compared	Always state the angle; fix it in the specification
Using 60° on very high or very low gloss	Poor resolution — real differences hidden	Use 20° above 70 GU and 85° below 10 GU
Measuring textured surfaces in one direction only	Apparent differences between samples	Measure along and across; agree the direction
Single reading	Poor repeatability	Average 3–5 readings; use the statistical mode
Uncured coating or warm sample	Gloss changes after measuring	Measure after full cure, at room temperature

8 · Applications — what is checked

Application	Typical angle	Why
Paints, varnishes, powder coatings	60°; 20° / 85°	Batch-to-batch consistency and agreement with the colour and gloss standard
Automotive body and interior parts	20°; 60° / 85°	High gloss of body paint, low gloss of dashboards and trim to limit reflections
Plastic parts and films	60°; 20° / 45°	Mould surface, processing conditions and appearance of the finished part
Furniture, wood and panels	60°; 85°	Uniform finish across a set of furniture or a batch of panels
Ceramic tiles, stone, sanitary ware	60°; 45° / 20°	Polish grade and uniformity of a tile batch
Paper, board, printing	75°; 60°	Paper grade, coating, print and varnish finish
Electronics housings and metal	20°; 60°	Appearance of visible parts; plating and anodising
Packaging and labels	60°; 20°	Shelf appearance and consistency between print runs
Fruit and food (small aperture)	60°, 2 × 4 mm	Objective grading of surface shine, for example of apples with edible coatings

Limit values come from your product specification; the gloss meter gives the comparable number.

9 · Gloss, colour and haze — how they connect

Gloss changes how a colour is seen. A matt and a glossy panel of the same paint look different because the matt surface mixes white, surface-reflected light into the colour. Colour spectrophotometers handle this with two modes: **SCI** (specular component included) gives the colour of the material regardless of gloss, **SCE** (specular component excluded) gives the colour as the eye sees it, which depends on gloss. If two samples match in SCI but not in SCE, the difference is gloss — and the gloss meter quantifies it. See the Colour Measurement Guide and our benchtop colour spectrophotometers.

For transparent materials the related property is haze — the milky look of light passing through a film or sheet. It is measured with a haze meter; see the Haze Measurement Guide. In coatings, plastics and packaging, colour, gloss and haze are often specified together.

10 · Choosing a model

	CGT268	CG268	CG60	CG60M	CG47
Angles	20° / 60° / 85°	20° / 60° / 85°	60°	60°	45° / 75°
Range	2000 / 1000 / 160 GU	2000 / 1000 / 160 GU	0–1000 GU	0–1000 GU	800 / 150 GU
Small aperture for curved parts	—	—	—	✓ 2 × 4 mm	—
Repeatability (0–100 GU)	±0.2 GU	±0.2 GU	±0.2 GU	±0.2 GU	±0.2 GU
Display	3.5″ colour touch screen	2.3″	2.3″	2.3″	2.3″
Power	Li-ion, rechargeable	AA or USB	AA or USB	AA or USB	AA or USB
Memory (readings)	5000	35 000	35 000	35 000	35 000

- **Laboratory and incoming inspection over the full gloss range** — CGT268.
- **Three angles in the field at a lower price** — CG268.
- **Routine control where the specification names 60°** — CG60.
- **Curved, narrow or small parts** — CG60M.
- **Ceramics, films, paper and board** — CG47.

All models store readings, offer basic, statistical, continuous and QC modes, and come with PC software for reports; a mini printer is available as an option.



20° / 60° / 85°, TOUCH SCREEN

CGT268

Colour touch screen · rechargeable · ISO, ASTM



20° / 60° / 85°

CG268

Three angles in one press · AA battery or USB



60° GLOSS METER

CG60

Single angle for routine control · 0–1000 GU



60°, SMALL APERTURE

CG60M

2 × 4 mm spot for curved and small parts



45° / 75°

CG47

Ceramics, films, paper and board

11 · Frequently asked questions

▼ What is a good gloss value?

It depends on the product. High-gloss car paint is typically above 80–90 GU at 20°, semi-gloss coatings between about 10 and 70 GU at 60°, and matt finishes below 10 GU at 60°. Your specification sets the target and tolerance, always together with the angle.

▼ Why does my gloss meter show more than 100 GU?

100 GU is the value of a black glass reference, not a maximum. Metals, mirrors and metallised films reflect more light and can read several hundred GU, up to about 2000 GU at 20°.

▼ Can I convert 60° readings into 20° or 85° values?

No. The angles respond differently to surface texture, so there is no general conversion. Measure at the angle the specification requires; a three-angle meter gives all three at once.

▼ Do I need a gloss meter if I already have a colour spectrophotometer?

Usually yes. A spectrophotometer in SCI and SCE mode shows that gloss affects the colour, but it does not give a gloss value in GU that can be specified and certified.

▼ How often should I calibrate?

At switch-on and whenever the temperature changes noticeably; most instruments calibrate automatically on the plate in the base. Check the plate itself periodically, as your quality system requires.

Read more

- Colour Measurement Guide — light, colour numbers, ΔE, geometries and instruments for colour.
- Haze Measurement Guide — haze, transmittance, clarity and light transmittance of transparent materials.
- Spectroscopy & Color overview — all our instruments for colour, gloss, haze and spectroscopy.

- Spectroscopy & Color catalogue — the full range, including models available on request.
- Gloss Measurement Guide (PDF) — this guide for printing and sharing.

Not sure which angle or gloss meter you need?

Send us your material, the gloss level you expect and the standard you report to. We will recommend the angle and the instrument, and can measure samples for you.

sales@colo.si

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