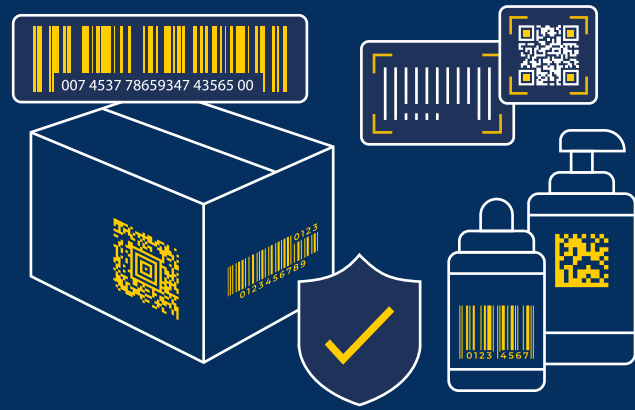


Barcode Grading in a Digital World

A Guide for FMCG/CPG Industries



In the FMCG (Fast-Moving Consumer Goods) and CPG (Consumer Packaged Goods) sectors, barcodes play a crucial role in inventory management, product authentication, regulatory compliance, and increasingly - consumer engagement.

Consumers and regulators alike demand greater transparency, traceability, and speed from CPG companies. Accurate and high-quality barcodes are essential to meet these expectations, especially as packaging designs, print runs, and global distribution become more complex.

This guide explores the evolving landscape of barcode grading in a digital world, highlighting the challenges, best practices, and future trends in FMCG/CPG industries.

What you will learn:

- ✓ The Evolution of Barcodes
- ✓ The Science of Barcode Grading
- ✓ Challenges of Grading Barcodes in a Digital World
- ✓ Barcode Verification: A Digital Perspective
- ✓ Future Trends in Barcode Technology for FMCG/CPG
- ✓ Appendix: Glossary and Recommended Resources

The Evolution of Barcodes

Barcodes have come a long way since their first commercial use in 1974, when a packet of Wrigley's™ chewing gum became the first product scanned at a checkout. Since then, barcodes have revolutionized the way CPG products move through the supply chain, allowing for faster checkouts, more accurate inventory, and greater visibility.

Today, **1D and 2D barcodes** are widespread across consumer goods. But their role has expanded far beyond logistics:



QR codes now link to a variety of rich digital content, including product origin stories, instructional videos, promotional campaigns, and personalized offers.



GS1 DataBar and **DataMatrix** codes power advanced use cases in traceability, regulatory compliance, and authentication.



Smart packaging integrations allow consumers to instantly access allergen information, usage instructions, recycling guides, and loyalty programs—directly from the product in their hand.

As packaging continues to evolve, so too does the barcode. It has become a powerful tool not only for tracking and compliance, but also for building trust and deepening consumer engagement in a digitally connected world.

The Science of Barcode Grading

What is Barcode Grading?

Barcode grading ensures printed barcodes are scannable across a variety of conditions including lighting, distance, different materials, substrates and equipment. It's the quality control process that guarantees your barcode will work as intended from warehouse to checkout.

Key Standards and Parameters

- **ANSI (American National Standards Institute)** and **ISO (International Organization for Standardization)** established print quality guidelines to objectively evaluate barcodes.
- **GS1** added further guidance tailored for applications like retail and healthcare.
- **ISO/IEC 15415 (2D barcodes)** and **ISO/IEC 15416 (1D barcodes)** set the foundational benchmarks for barcode grading today.

Grading typically results in a letter score (A to F) or numeric score (4 to 0), based on visual and contrast-related measurements.

Challenges of Grading Barcodes in a Digital World

Why Early Verification Matters

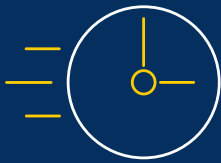
While it's common practice to inspect printed barcodes after production, that alone is not enough. Barcodes must also be verified much earlier - at the digital artwork stage - for two critical reasons:

- To confirm the barcode is the correct one: This includes checking that the encoded data (e.g., GTIN, expiry date, or batch number) is accurate and appropriate for the product.
- To ensure it is technically correct: This means for example, verifying the barcode complies with industry standards, has sufficient **quiet zones**, and is sized appropriately for its packaging context.

Doing This Early Matters

Verifying barcodes at the digital artwork stage is not optional—it's essential. Early validation offers clear advantages:

It's faster: Corrections made during prepress are simple and immediate, avoiding delays across production schedules.



It's cheaper: Detecting errors before files are released prevents costly reprints, packaging waste, and rework involving multiple departments.



It reduces complexity: Early fixes avoid cascading issues that impact operations, supply chain logistics, and regulatory compliance down the line.



Put simply:

If a barcode is technically wrong at the artwork stage, **fixing it immediately is far easier and less expensive** than discovering the error after printing—when multiple teams, re-approvals, and even scrapped inventory could be involved.

Verifying barcodes digitally **should be a standard part of every packaging workflow**, ensuring problems are caught when they are cheapest and simplest to resolve—**not after they become production emergencies**.

From Ink to Pixels: A Workflow Shift

Barcode grading has historically focused on physical printed samples, assessed with scanners that simulate real-world use. But digital workflows have exposed a fundamental limitation in this approach.

Many tools are built to evaluate only printed output. They fall short when used during the design and prepress stages because:

- Errors specific to digital artwork such as incorrect encoding or layout issues are invisible to print-focused tools.
- Physical variables like substrate reflectivity, print density, or ink spread are not yet present in the artwork, making traditional grading incomplete.

Print-Only Issues That Digital Checks Can't Catch

Certain barcode defects only manifest during printing and can't be predicted from digital files alone:

1. Low Contrast – Caused by insufficient ink or use of dark substrates.
2. Voids/Smudges – Introduced by debris on plates or printing inconsistencies.
3. Ink Bleed – Occurs on absorbent materials or with poorly controlled presses.

Because these issues are undetectable at the artwork stage, relying on traditional grading tools during digital proofing can provide a false sense of security. Instead, teams must use digital verification tools that focus on what can be controlled prepress complementing (not replacing) print-based checks.

Barcode Verification: A Digital Perspective

What Can Be Verified Digitally?

To ensure barcode accuracy without relying on misleading visual scores, brands and agencies should use **verification tools purpose-built for digital files**. These tools focus solely on what can be validated at the artwork stage before any ink hits the substrate.

Here are **some key examples** of criteria that can be digitally verified:

- **Quiet Zones** – Confirms there is enough clear space surrounding the barcode for scanners to detect its start and stop patterns.
- **Magnification Factor** – Ensures the barcode meets minimum sizing requirements based on packaging specs and scan distance.
- **Decode Logic** – Validates that the data encoded (e.g., GTIN, expiry date) follows proper formatting and checksum rules.

But that's just the beginning. **Digital verification can also include checks like:**

- **Bar width accuracy** – Ensures module widths are consistent with barcode symbology specs.
- **Axial non-uniformity** – For certain formats like DataMatrix, the width-to-height ratio must fall within strict limits.
- **Symbol placement** – Some barcode types must appear in specific orientations or zones depending on packaging regulations.

Note:

These checks vary depending on the **type of barcode** - whether it's a UPC-A, GS1 DataMatrix, or a QR Code. Each format has unique rules and tolerances.

For instance, **GS1 DataMatrix barcodes** used in pharmaceuticals must include an Application Identifier (AI) for batch number and expiry, formatted in a specific sequence. **This rule does not apply** to retail-focused UPC codes. That level of nuance means a one-size-fits-all tool will miss critical compliance errors, or worse, flag incorrect barcodes as correct.

Digital verification tools use binary Pass/Fail logic, giving teams immediate, clear results and confidence before a file ever reaches the printer.

And because the logic behind these tools is deeply standards-based and context-sensitive, it requires expert-level calibration, something only a few specialized systems (and teams) can deliver with consistency and precision.

Choosing the Right Barcode Verification Software

Selecting the right barcode verification tool is crucial for creative agencies, print agencies, and CPG manufacturers. Consider:

- **Compliance Standards** – Look for tools built on ISO and GS1 specifications.
- **Digital-Only Focus** – Software should ignore physical print variables it cannot know or simulate.
- **Workflow Integration** – It should plug into your existing prepress systems and design platforms.

Ask the Right Questions

Beware of solutions claiming to simulate print characteristics. Ask:

- Can the tool verify actual substrate or laminate properties?
- Does the software digitally calculate key print characteristics like contrast or reflectivity using real, measurable data?
- Does the tool rely on estimated print conditions (such as assumed ink density or substrate reflectivity)?



Important:

If a vendor answers yes to any of these questions, it's a red flag. **Only handheld scanners or specialized verification hardware** can accurately assess substrate reflectivity or print density. Simulating these parameters from a digital file is not reliable, **trust these simulated results at your own risk.**

Transparency and precision are critical to maintaining brand trust and ensuring barcode performance across the supply chain. Choose solutions that clearly distinguish what can and cannot be verified at the digital artwork stage.

Future Trends in Barcode Technology for FMCG/CPG

E-Labeling: The Future of Smart, Sustainable Packaging

The future of barcodes is evolving rapidly as FMCG/CPG companies embrace digital transformation. Innovations are not just about improving how barcodes look and scan—they're about unlocking new levels of visibility, compliance, sustainability, and consumer engagement.

E-Labeling Integration: Merging Sustainability with Compliance

E-labeling is gaining traction as a way to minimize packaging clutter, reduce environmental impact, and ensure consumers and regulators have access to the most current product information.

Why it matters:

- **Packaging Simplification:** Digital labels allow brands to keep packaging clean and visually appealing while still offering access to important data like ingredients, allergens, usage instructions, and recycling info.
- **Global Flexibility:** Instead of printing multiple versions of packaging for different regions, one label can link to localized digital content, supporting multilingual markets and rapid updates.
- **Regulatory Preparedness:** Regulatory bodies are increasingly allowing or encouraging e-labeling, especially in markets with sustainability goals. Brands that adopt it early are more agile and future-ready.

Key Takeaways

Barcodes may occupy a small footprint on packaging—but their impact on product success (or failure) is enormous.

In today's complex FMCG and CPG environments, **barcode verification is not a one-time event—it's a two-phase process:**

1. **Digital Verification** during the artwork stage ensures that the barcode is the correct one and technically compliant. This early check confirms encoding accuracy, sizing, quiet zones, and more format adherence before a file is ever released for print.
2. **Print Inspection** then validates that the barcode has been printed correctly ensuring proper ink coverage, contrast, and scannability under real-world conditions.

These two stages serve different purposes and require specialized tools. Digital verification ensures design accuracy and standards compliance. Print grading ensures real-world performance and production quality. One does not replace the other: they work in tandem to safeguard product quality and brand integrity.

By integrating both approaches into your workflow, you can reduce errors, avoid costly reprints, and deliver barcodes that perform exactly as intended—from digital file to physical shelf.

Appendix

Glossary of Barcode - Related Terms

- **Quiet Zone** – Required space around the barcode for successful scanning.
- **Reflectance** – The barcode’s ability to reflect light, affecting scannability.
- **Magnification Factor** – Barcode size adjustment for compliance.
- **Decode** – The ability of a scanner to read and interpret a barcode correctly.

Recommended Resources

- [GS1 General Specifications](#)
- ISO/IEC [15415](#)
- ISO/IEC [15416](#)
- [CPG Packaging Guidelines for Barcode Placement & Size](#)

Connect with us



[linkedin.com/company/schlafender-hase](https://www.linkedin.com/company/schlafender-hase)



[@schlafenderhase275](https://www.youtube.com/@schlafenderhase275)



[@schlafender_hase](https://www.instagram.com/@schlafender_hase)



[facebook.com/SchlafenderHase](https://www.facebook.com/SchlafenderHase)

www.schlafenderhase.com

Contact us

SCHLAFENDER HASE GMBH

St Martin Tower,
Franklinstr. 61-63,
60486 Frankfurt am Main,
Germany

Phone: +49 69 244 481 0

Email: TVT@sh-p.com

SCHLAFENDER HASE INC.

245 First Street Suite 1800 – 103,
Cambridge, MA 02142-1292,
USA

Phone: +1 617 607 4900

Email: us@sh-p.com