KNOWLEDGE BASE ARTICLE

Error Correction and Size: Making QR Codes Reliable to Scan and Print

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Introduction

A QR code that looks fine on the screen may fail on a badge, on a poster across the hall or on a sheet that has spent a month on a notice board. Whether a code is read depends on three things: how much data it holds, how much reserve it has against damage, and how large it is where it is scanned. In QR Code Generator the last two are controlled by the **Error Correction** and **Size** sections. This article explains both and gives practical figures for print.

How data makes the code denser

A QR code is a grid of dots. The more text is encoded, the more dots the grid needs; since the image keeps the same size, each dot becomes smaller. Small dots are the main reason why a code is not read from a distance or from a small print.

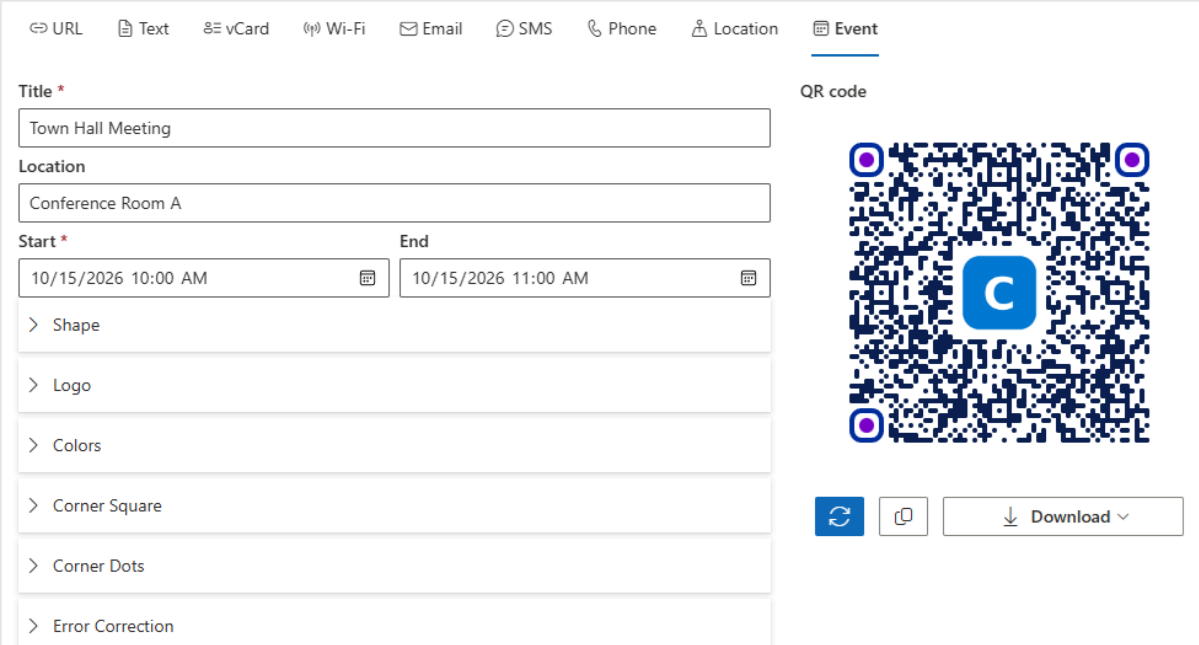
The first rule of a reliable code is therefore to encode less:

- use a short link instead of a long one with parameters;
- on the **vCard** tab, fill in only the fields that are needed;
- keep the message on the **Email** and **SMS** tabs brief.

Error Correction

A part of the dots carries no data of its own: it repeats the data in a form that lets a scanner restore what is lost when the code is dirty, torn or covered. The **Error Correction** section sets the size of this reserve.

Level	Share of the code that can be restored	Effect on the code
Low	About 7%	The sparsest code, the smallest reserve
Medium	About 15%	A balance for screens and clean prints
Quartile	About 25%	The default; a good reserve at a moderate density
High	About 30%	The largest reserve, the densest code



The Error Correction section

The reserve is not free. A higher level adds dots, so for the same data the code becomes denser. Choose the level by the conditions in which the code lives:

Situation	Recommended level
A long text or a full business card shown on a screen	**Low** or **Medium**
A link on a page, in an email or on a slide	**Medium** or **Quartile**
A code with a small logo	**Quartile**
A code with a large logo	**High**
A print that may be scratched, creased or stained: a badge, a sticker, an outdoor sign	**High**

Note

A logo in the center covers a part of the dots, and the scanner restores them from the same reserve. That is why a logo and a low level do not go together. See KB10266. How to Add a Company Logo to a QR Code.

Size

The **Size** section sets the width and the height, in pixels, of the image that is downloaded or copied. The image is always square. The range is from 300 to 4000 pixels in steps of 100, and the default is 1200. The preview in the web part does not depend on this value and is always 300 pixels wide.

The setting applies to the raster formats — PNG, JPEG and WebP — and to the copied image. An SVG file is a vector image and can be scaled to any size, so for print it is the safest choice.

Pixels and print size

For a sharp print a raster image needs about 300 pixels per inch. The table shows the largest print size that each value gives at this quality.

Size, pixels	Largest sharp print
300	2.5 x 2.5 cm (1 x 1 in)
600	5 x 5 cm (2 x 2 in)
1200	10 x 10 cm (4 x 4 in)
2400	20 x 20 cm (8 x 8 in)
4000	34 x 34 cm (13 x 13 in)

For anything larger, download the code as SVG.

Print size and scanning distance

How large the code must be on paper depends on the distance from which it is scanned. A practical rule: the side of the code should be about one tenth of the scanning distance.

Where the code is placed	Typical distance	Side of the code, at least
Business card, badge	15–20 cm	2 cm
Flyer, table sign	30–50 cm	3–5 cm
Poster on a wall	1–2 m	10–20 cm
Banner, screen in a hall	3–5 m	30–50 cm

The rule assumes a code of ordinary density, such as a link. For a dense code — a full business card, a long text, the **High** level — add a third to the size.

Warning

Do not print a code smaller than 2 x 2 cm. Below this size the dots merge on ordinary printers, and many phone cameras cannot focus on them.

The margin around the code

A scanner finds the code by the contrast between the code and the empty area around it. The image produced by the web part ends exactly at the edge of the code and has no margin of its own. When you place the image in a layout, leave an empty area around it of about four dots in width, in the color of the background, and do not let text, a frame or a picture touch the code.

Checklist before printing

1 The data is as short as it can be.
2 **Error Correction** matches the conditions: **High** for a large logo and for prints that wear out.
3 The dots are dark, the background is light and opaque. See KB10265. Customizing the QR Code Design: Shape, Colors, Gradient and Corners.
4 The file is SVG, or a PNG with enough pixels for the print size.
5 The printed code is large enough for the scanning distance and has an empty margin.
6 A test print was scanned with at least two different phones from the real distance.

Summary

Less data and a larger print make a code easy to read; **Error Correction** protects it against damage and a logo at the cost of density; **Size** decides how sharp a raster image is in print. When in doubt, shorten the data, keep **Quartile**, download SVG and test a real printout.

Tip

The file formats are compared in KB10268. Downloading and Copying a QR Code: PNG, JPEG, SVG and WebP. If a finished code is not read, go through KB10276. Why Doesn't My QR Code Scan?.