## barkeder

## Mobile Barcode Scanner Development Kit (SDK)

Whether you're developing a mobile, web-based or a desktop application, the barKoder SDK provides a comprehensive solution that ensures reliable and efficient barcode scanning across various devices and platforms. With continuous updates and dedicated technical support, utilizing our mobile barcode scanner SDK opens up a world of possibilities for your application, empowering you to deliver a superior barcode scanning experience to your users and unlocking new opportunities for your business.

By integrating our Barcode Scanner SDK into your application, you gain access to a powerful set of tools and functionalities that will revolutionize the way you handle barcode scanning. Our SDK offers seamless integration with your existing software, allowing you to effortlessly incorporate barcode scanning capabilities into your own application or system. With our SDK, you can harness the full potential of barcode scanning technology, enabling you to automate processes, improve data accuracy, and enhance user experiences.

## Broad range of symbologies and platform support

The barcode scanner SDK by barKoder supports iOS devices including Apple ${ }^{\circledR}$ 's iPhone ${ }^{\circledR}$ and iPad ${ }^{\circledR}$, as well as most Android ${ }^{T M}$ smartphones and tablets for mobile barcode reading. It can read over 25 different 1-D and 2-D barcode symbologies used across a wide range of industries.

## 1D Barcodes

Codabar, Code ll, Code 25 (Standard/Industrial 2 of 5), Code 39 (including Code 39 extended), Code 93, Code 128, COOP 2 of 5, Datalogic 2 of 5, EAN-8, EAN-13, IATA 2 of 5 , Interleaved 2 of 5 , Matrix 2 of 5, MSI Plessey, Pharmacode, Telepen, UPC-A, UPC-E, UPC-EI

## 2D Barcodes

Aztec Code, Aztec Compact, Data Matrix, DotCode, PDF417, Micro PDF417, QR Code, Micro QR Code


## Simple Usage

Our decoder is simple and easy to use! Just point to your barcode and liftoff!


## Time and Cost Reduction

Increase efficiency, cost-saving, and improve customer satisfaction with barKoder. There is no need to spend money on expensive external readers.

## High Performance

Scan poorly printed, damaged or partially obscured barcodes in any environment with very high accuracy, superior quality and unprecedented reliability.

## BYOD

Simplify your business processes by encouraging the Bring Your Own Device concept \& eliminate the need to maintain unnecessary hardware that becomes obsolete in several years.

## Platforms

Mobile: Android, iOS, Flutter, React Native, Xamarin, Capacitor

## barKoder

## Barcode Capture SDK Unique Features

With the integration of barKoder, it is no longer necessary to develop separate applications and manage multiple software and hardware solutions for mobile device barcode reading. Our SDK offers to developers a robust set of tools in a single solution, allowing maximum control over the user experience. It provides a high-level, simple to use interface for device management, whether using a smartphone or tablet.

## DPM Processing

Unique Direct Part Marking (DPM) reading algorithm which allows for even the hardest possible engraved Data Matrix samples to be decoded. Judging by our own internal tests, it is already better than any competitor alternative in the market by a large margin, even with its first version!


LineSight ${ }^{\circledR}$-PDF417 Scanner
We reinvented the PDF417 scanning process with a completely new and unique approach that lead to barKoder allowing for a complete absence of start and stop patterns of PDF417 codes

## Batch MultiScan ${ }^{\circledR}$

Special AR algorithm allowing realtime scanning with results caching and location reconstructions of multiple barcodes within a single camera view in a continuous manner, providing smooth visual experience and stable output.

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## Severe Blur Scan

Specialized mode for scanning heavily blurred EAN \& UPC barcodes, both in real-time and via images.



To experience the speed of our barKoder Demo App for testing, on your iOS or Android device, simply head to your prefered App Store by clicking on the buttons, or you can scan the code with your camera app.
barKoder Mobile Demo App for iOS


SCAN ME
barKoder Mobile Demo App for Android


## Testing, Testing, Testing Sheet!

Optimizing your experience with our app is effortless using our comprehensive testing sheet encompassing a variety of 1D and 2D barcode types. Simply print or display the sheet on your device, and proceed to scan each barcode using our application. This efficient testing method ensures that our app seamlessly recognizes and processes diverse barcode formats, assuring you of its reliability and versatility across different code types.


## Linear (ID) Barcodes

Codabar, Code ll, Code 25 (Standard/Industrial 2 of 5), Code 39 (including Code 39 extended), Code 93, Code 128, COOP 2 of 5, Datalogic 2 of 5, EAN-8, EAN-13, IATA 2 of 5, Interleaved 2 of 5, Matrix 2 of 5, MSI Plessey, Pharmacode, Telepen, UPC-A, UPC-E, UPC-E1

Codabar

Code 11

Code 25

Code 32


Code 39


Code 93

Code 128


EAN/UPC Code



Telepen

## 2D Barcodes

Aztec Code, Aztec Compact, Data Matrix, DotCode, PDF417, Micro PDF417, QR Code, Micro QR Code


## Batch MultiScan

The Batch MultiScan is a special ability of the barKoder Barcode Scanner SDK that grants an ability to scan multiple barcodes in a single camera view

## Improve Efficiency by Scanning Multiple Barcodes at Once

With the barKoder Barcode Scanner SDK for mobile apps and websites, your users can decode multiple barcodes regardless of their type or size in one go. The barKoder API covers all common 1D and 2D barcode symbologies, enabling intuitive and fast data capture while delivering an accuracy of at least $99 \%$, even under the most difficult scanning conditions.

## Enable Your Enterprise Apps to Scan Multiple Barcodes

Multiple barcode scanning is time-efficient in various scenarios, such as shipping labels, supermarket price tags, inventory counting, etc. It greatly speeds up the barcode scanning process and streamlines the workflow. Depending on different use cases, the count of barcodes in one image can vary from a few to dozens. And the barcodes can vary in symbologies (1D, QR Code etc.) and sizes. As to the layout, the barcodes can be neatly placed in a matrix or randomly scattered.


## Warehouse Inventory Management

Driven by safety, convenience and low-cost, many warehouses turn to tracking inventory using all kinds mobile devices and not just smartphones or tablets, but also automated guided vehicles (AGV), mobile robots or drones. To expedite the counting procedure, the barKoder SDK's Batch MultiScan feature is optimized for scanning dozens of codes at once.


## Library Bookshelf Management

The Batch MultiScan can capture the content of multiple barcodes printed on books and placed on bookshelves. The scanned barcode values can afterwards be sent to the database to query its correct position in real time or to confirm/deny their presence.


Specimen Traceability
It is a widespread practice to attach each tube, vial or specimen cassette with a QR code or a Data Matrix code for identification. Using the Batch MultiScan feature of the barKoder Barcode Scanner SDK speeds up registering samples in a database significantly.


## Pharma Track and Trace

Data Matrix is the most used barcode symbol for tracing pharmaceutical products and the Batch MultiScan can help you meet the track and trace requirements of medicine packages, bundles or cases throughout the entire logistics supply chain from the manufacturer to the wholesaler, and then to a pharma store.


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## MatrixSight

At the core of our cutting-edge decoding solution lies MatrixSight, an algorithm that some among us dare to deem groundbreaking. Exclusively featured in our barKoder software, MatrixSight is meticulously designed to redefine the very standards of mobile barcode recognition. This exceptional algorithm transcends the constraints of conventional decoding, establishing a new benchmark for reliability, accuracy, and versatility.

In a landscape where traditional decoders falter, MatrixSight stands out with its unique approach to locating and processing 2D patterns, particularly in Data Matrix and Micro QR variants. This enables barKoder to effortlessly decode barcodes with levels of damage that were once deemed insurmountable.

## QR Barcode

For optimal barcode detection, the majority of decoders in the market rely on the three finder patterns prescribed by the QR standard specification. This includes:

Positioning Markers: The finder pattern comprises three square markers, often referred to as squares or modules. These squares are positioned at the corners of the QR code.

Alignment: The three squares are arranged to form a
 larger square, helping the QR code reader identify the code's orientation and perspective. This alignment is crucial for accurate code recognition.

Quiet Zone: The QR code's finder pattern is surrounded by a quiet zone or margin, which is an empty space with no data. This allows the QR code reader to distinguish the code from its surroundings and helps prevent misinterpretation.

The presence of the finder pattern in a QR code makes it easily detectable by image-processing algorithms used in QR code readers. Once the finder pattern is identified, the QR code reader can then proceed to decode the information contained within the code. The finder pattern specification is part of the overall QR code standard, which ensures interoperability and uniformity in QR code usage.

While some advanced decoders can manage slight damage on these patterns, many struggle even with moderate impairment.


## Missing 2 finder patterns

But once there is more damage to the barcode, all of them struggle with successfully decoding the barcode.

None can endure the absence of two missing finder patterns.


Missing all finder patterns and alignment paterns
Finally, with barKoder even heavily damaged barcodes pose no challenge. As shown here, this barcode is missing all 3 finder patterns and the alignment pattern.

Taking innovation to the next level, our cutting-edge technology can scan even the barcodes that have a remarkable degree of damage.

## Slight Damage - Missing one finder pattern

Furthermore, the best on the market can accommodate a single missing or damaged finder pattern, like shown on the image.


Missing 3 finder patterns
barKoder, empowered with MatrixSight can easily scan these barcodes, and even the ones that are missing all three finding patterns.

Image shows a QR barcode that has only the alignment pattern present, while all 3 finder patterns are completely missing. Still scannable with barKoder.


No other decoder on the market, aside from barKoder, possesses the capability to handle damage to such an extent.


## Funky use cases

This leads to barKoder being able to scan some funky codes out there, for example you could slap this barcode on your donut company and make for great PR. Obviously your donut consumers would need to use our scanner to read it, so most of them will be left scratching their head when they try to read it with a stock barcode scanner, but your proprietary app that uses MatrixSight could scan it.

Missing all finder patterns and alignment patterns and random damage

Remarkably, what may be considered a worst-case scenario for other decoders, as shown here, where not only there are no finder patterns and an alignment pattern, but there's also damage in the data of the image, is not a challenge for MatrixSight. It goes beyond, addressing damages until the missing portion of the barcode reaches a theoretically unrecoverable size, showcasing the exceptional resilience of our technology.

## Micro QR Barcode

A similar scenario unfolds Micro QR Code variant, which is a smaller and more compact version of the traditional QR Code. It was specifically designed to encode a smaller amount of data and to be scanned quickly, making it suitable for applications with limited space or where larger QR codes might be impractical. Like the standard QR Code, the Micro QR Code also contains a finder pattern to help QR code readers locate and properly interpret the code.

The finder pattern in Micro QR Code is adapted to fit the smaller size while maintaining the essential features for reliable scanning.

So in a nutshell, it only has one finder pattern.


Even the slightest damage to this pattern proves insurmountable for most existing decoders, causing them to fail. In contrast, for barKoder utilizing MatrixSight, reading a Micro QR barcode without any finder pattern is a straightforward task. MatrixSight goes above and beyond, effortlessly handling more extensive damage across the barcode.


Missing Finder pattern and corner damage
However, that's not all that MatrixSight can do. Here's an example where the finder pattern is completely gone but we also see severe damage to the corners of the barcode and random damage in the data patterns. Still scannable with barKoder.

## Data Matrix

Similar to QR Codes, Data Matrix includes a finder pattern to assist barcode readers in locating and decoding the symbol. The finder patterns typically consist of solid borders around the data region, making it recognizable to scanning devices.

Timing pattern - is placed on the two opposite sides to Finder Pattern, where alternate black and white modules. Timing Pattern (Clock Pattern) is used to determine the size of a module, the number of rows and columns, and possible distortion of code.

When faced with challenges such as missing modules in the Timing pattern or slight damage to the Finder pattern, the decoding capabilities of most decoders diminish, with only the most advanced ones demonstrating resilience to this level of damage.


Missing Finder pattern
While only a select few decoders, alongside barKoder, can manage the complete absence
of the finder pattern.

Remarkably, MatrixSight, can tolerate up to three entirely missing rows and/or columns from any side of a barcode with a size greater than 48 modules and up to two for smaller ones. This unparalleled level of tolerance positions MatrixSight as the unrivaled leader in handling Datamatrix barcodes with varying degrees of

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damage and complexity.


With barkoder the decoding journey takes a leap forward. Thanks to our MatrixSight algorithm, barKoder effortlessly handles barcodes with missing Timing patterns and slight damage to the Finder pattern. What sets barKoder apart is its ability to transcend the conventional need for finder or timing patterns altogether.



Missing finder, both top and left timing patterns, one whole row from top and column from right

Finally, barKoder showcases exceptional prowess in barcode scanning, boasting next-level adaptability in decoding even the most challenging barcode scenarios. Shown here is the absence of critical elements such as the finder pattern, both top and left timing patterns, along with the omission of an entire row from the top and a column from the right, barKoder remains undeterred.

Its advanced algorithms and robust design empower it to seamlessly scan and interpret barcodes with missing components, demonstrating unparalleled efficiency and reliability. In situations where other scanners may falter, barKoder consistently delivers accurate results, making it the optimal choice for industries and businesses requiring superior performance in diverse and complex scanning environments.

Missing finder and both top and left timing patterns

Notably, the capabilities of barKoder extend even further, surpassing conventional expectations. In the event of encountering a barcode lacking not only the finder pattern but also both the top and left timing patterns, barKoder seamlessly continues its scanning process, demonstrating its remarkable ability to effortlessly decode such codes.


## Complete destruction

As a PS let's show a barcode that has been completely destroyed, missing all the critical elements, as well as parts of the data elements. Naturally, this should not be scanned, ever, however barKoder adapts to this case too and scans it with ease.

## VIN Scanning Mode

In the automotive industry, VINs serve as unique identifiers for vehicles, carrying crucial information about their make, model, year of manufacturing and other specific details. Traditionally, barcodes like Code 39 or Code 128 have been used to encode VINs on vehicle components and related paperwork. These barcodes are effective for basic identification purposes, but they have limitations when it comes to data capacity and quick readability.

Our barcode scanning SDK solution offer a specially tailored VIN reading mode that supports both the traditional Code 39 and Code 128 barcode formats, as well as the newer QR Code and Data Matrix VIN variants.

## VIN Encoding With Code 39 Barcodes

Code 39 has played a historical role and can still be found on many older cars that are currently in use. Recognized for its simplicity and widespread acceptance, Code 39 efficiently encodes alphanumeric characters, serving as a reliable method for tracking and managing vehicle information.

Code 39 has an alphanumeric compatibility, capable of encoding both letters ( $\mathrm{A}-\mathrm{Z}$ ), numbers ( $0-9$ ), and a few special characters, which makes it the perfect candidate for representing a VIN which is alphanumeric in its nature.


When used in VINs, the Code 39 symbology adheres to some specific rules inherited from the nature of the VIN itself. These are:

- Fixed length: This means that instead of the variable length of the data, when used to encode a VIN barcode the length is fixed and it's typically 17 characters long.
- Check character: Another specific feature of VIN codes is the check character, which is optional for a normal Code 39 barcode, but required when Code 39 is utilized as a VIN code.

These constraints make VIN Code 39's much safer for a barcode scanner to "know" it's dealing with a VINempowered barcode, but they also force us to use the scanner in a specific VIN mode. Our demo app Barcode Scanner by barKoder, available for both iOS and Android via Google Play Store and Apple App store, features this specifically tailored VIN Scanning mode that showcases the ability to decode these barcodes with ease. We're yet to encounter a solution which comes even close in terms of performance and reliability.

However, the barKoder Barcode Scanner SDK doesn’t stop there. Empowered with the Segment Decoding ${ }^{\circledR}$ algorithm it can scan barcodes with significant deformation alongside the Z-axis, which makes it ideal for scanning VIN numbers that are slightly deformed,printed on paper for listing inventory, or taped to a car window.

Empowered with the Segment Decoding ${ }^{\circledR}$ technology, the barKoder Barcode Scanner SDK handles these barcodes with extreme efficiency.

To fully experience the barKoder VIN scanning mode, start with downloading our demo apps from the public app stores for either iOS or Android powered smart devices. Afterwards, simply follow the next steps:


While some advanced decoders can manage slight damage on these patterns, many struggle even with moderate impairment.

The specific setting is termed Enable Misshaped Code Capture (circled with green on the image).

- Also worth mentioning is to have Decoding Speed setting at SLOW and barKoder Resolution at Full HD. These settings are not a requirement, and the decoder will work even on Normal/HD, however some very damaged or otherwise altered barcodes will be scanned much faster if the settings are set as specified.
- Another thing worth mentioning is that due to the nature of VIN barcodes (they are 17 characters long), the best way to decode the misshaped VIN samples is via Landscape mode.



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## Code 128 Barcodes \& VIN Implementation

Code 128, a high-density, alphanumeric ID barcode symbology, stands out in the automotive industry for encoding VINs. Known for its versatility, Code 128 efficiently represents alphanumeric characters, making it a good choice for encoding the diverse information embedded in VINs.

Code 128 is often considered superior when it comes to encoding VINs to Code 39, due to a few key features:

- Higher Data Density:

Code 128 has a higher data density compared to Code 39, which means that Code 128 can encode more information in a smaller space. VINs, which often contain a specific set of alphanumeric characters, benefit from the increased efficiency of Code 128 in terms of data representation.

- Higher Data Security:

Code 128 includes a built-in error-checking mechanism which Code 39 lacks, further enhancing data security. It uses a checksum formula to verify the accuracy of the encoded data during the scanning process. This greatly helps in ensuring that the scanned VIN is correct and reduces the likelihood of errors in data transmission.

- Wide character set:

A Code 128 barcode can encode a full 128 ASCII character set, while Code 39 barcodes can encode 39 characters in total.

Similarly to Code 39, empowered with the Segment Decoding ${ }^{\circledR}$ technology our barcode scanner SDK can easily recognize highly distorted and deformed Code 128 VIN codes:




## QR Code Utilization In VIN-enabled Scenarios

QR codes, or Quick Response codes, have gained widespread popularity due to their quick readability and ability to store a substantial amount of data in a two-dimensional format. While they find extensive uses across a variety of industries, their application in encoding Vehicle Identification Numbers (VINs) within the automotive sector is not as prevalent as the respective ID barcode types (Code 39 and Code 128).

However, there are specific applications and scenarios where QR Codes have been employed for VIN-related
 purposes.

The primary advantage of QR Codes lies in their efficiency in storing information. They can encode alphanumeric characters, binary data and even special characters, providing a versatile means of representing diverse types of information. This flexibility makes QR Codes valuable in numerous applications, ranging from marketing and logistics to healthcare and finance.

QR codes are fairly easy to scan even with open-source solutions. However, if there's any damage present to their finder patterns most of the barcode scanners will fail scanning such samples. Not barKoder. Using the cutting-edge MatrixSight ${ }^{\circledR}$ decoding algorithm, we can recognize significantly damaged QR barcodes. MatrixSight® enables the barKoder API with a capability of capturing the data even in VIN QR Codes that have damage to both the finder pattern and the alignment pattern.

We won't go into detail of how it works, but we will show a few damaged QR VIN codes that the barKoder SDK can reliably scan.



## Data Matrix \& VINs - Match Made In Heaven

As technology advances, 2D barcodes like Data Matrix will continue to gain prominence. Data Matrix can store a significant amount of data in a compact space, providing a huge advantage over ID barcodes. While not as commonly used for VINs, it finds applications in more data-intensive scenarios, offering increased information capacity.

As in the case of the capacity to capture QR Codes, MatrixSight ${ }^{\circledR}$ empowers the Barcode Scanner SDK to smoothly capture the data even within severely damaged Data Matrix samples that are not only

Data Matrix


Finder Pattern Timing Pattern missing their critical finder and/or timing patterns, but also ones with random damage throughout the data section of the barcode:




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One of the latest technological advancements of the barKoder Barcode Scanner SDK is the unparalleled capability to decode heavily blurred EAN \& UPC barcodes, even when there's a fusion between the separate bars. This technological breakthrough is a game-changer, especially in scenarios where UPC \& EAN barcodes may undergo severe distortions and degradations due to various factors.

Traditional hardware-based barcode scanners often struggle when faced with heavily blurred or smudged barcodes. However, the advanced algorithm and image processing techniques embedded in the barKoder Barcode Scanner API enables it to decipher information from UPC \& EAN barcodes that would otherwise be unreadable. Whether the blurring is a result of poor printing quality, environmental conditions or other factors, the barKoder Scanner API excels in delivering accurate and swift barcode recognition.

## Lens Blur

The barKoder SDK leverages advanced optics algorithms to compensate for distortions caused by different lenses. This ensures that barcodes captured through a variety of devices, from high-end cameras to smartphones, can be reliably decoded.


## Focus Blur

Whether dealing with close-up shots or situations where the camera struggles to focus, the barKoder API's focus blur support guarantees that the barcode decoding process remains robust and dependable.


## Motion Blur

In scenarios where the barcode or the scanning device is in motion, the barKoder API's motion blur compensation algorithms come into play. This feature ensures that even rapid movements during the scanning process does not compromise the accuracy of barcode decoding.



## Segment Decoding ${ }^{\circledR}$

## 1D Misshaped Barcodes

barKoder stands out for its unique ability to scan ID barcodes with significant deformation along the $Z$ axis. Unlike other decoders that struggle when at least one straight line can't intersect through all bars, barKoder excels in handling such deformations, possibly due to advanced algorithms or image processing techniques. This feature allows it to decode distorted or skewed barcodes more effectively.


This is the limit of deformation for most of advanced decoders on market.


Once there's no straight line which can pass through bars, no decoder except barKoder is able to decode it. Note: option for decoding misshaped barcodes is off by default, one has to enable it in demo application or SDK. Here are some extreme deformations examples which barKoder can handle


PDF417 is a two-dimensional stacked barcode symbology capable of encoding large amounts of data in a compact space. Detailed data for this type of barcode can be found on our site in the barcode types section.


The PDF417 barcode by design has stacked data rows columns enclosed by Start and Stop patterns which are mandatory by specification for detecting its location within an image. Following the Start pattern and all the way to the Stop pattern are the "Row Indicator" columns where all necessary info for correctly decoding PDF417 is encoded, like the number of rows and columns, the error correction level and so on.

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