Leuze electronic

the sensor people

SMART
SENSOR
BUSINESS

BAR CODE DETECTION

White Paper

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Chapter 1

WHAT IS A 1D BAR CODE AND WHAT IS IMPORTANT – THE FUNDAMENTALS OF A 1D BAR CODE.

Welcome to Leuze electronic bar code detection 101. This is a collection of chapters to provide you more information about technologies and products to make your life easier and less complicated.

We all know bar codes are used in many industries from managing Material flow/ Materials handling companies, Electronics manufacturers, Automobile manufacturers and Automotive suppliers, Wholesale and Retail with consumer items including both food and non-food packaging, Aviation, Order processing, Post distribution and In-house post, Public authorities, Logistics companies and more.

In lab automation there are specific applications including the tracking of **blood samples and sample tubes. In medical applications, clinical logistics, packaging and pharmaceuticals** for tracking of product descriptions and more.

So why use a bar code and why are they so popular?

Bar codes provide a high degree of data security, with high first read rate probabilities, automatic bar code identification results with the lowest error rate, high productivity and throughput (quantity) and highly reliable reading systems performed inexpensively.

What should be important to you?

The bar code results can be further processed perfectly in automatic systems, the bar code information can be read on the label with the additional text line, low-cost label material can be purchased like printers and readers, and simple training should be needed for operators and users. These systems should be able to be used in almost all environments.

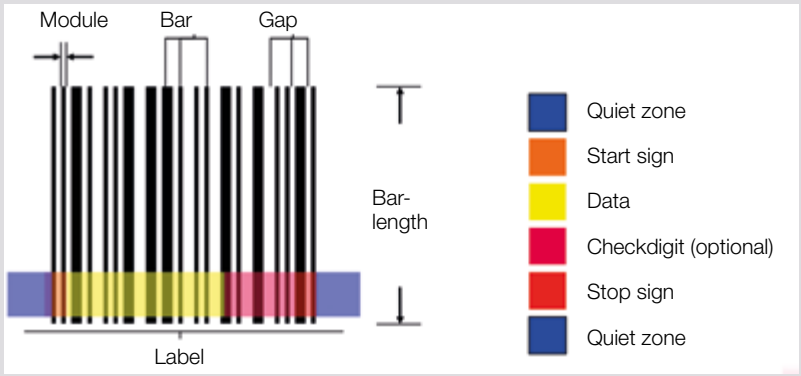
What are the fundamentals needed to accomplish these tasks?

Bar codes need to include at least the following:

- **Quiet zone (B_Z)** = the light area before the start character and after the stop character of a bar code. The quiet zone (min. 10 x Module) is needed in order to indicate the start of the bar code to the scanner.
- **Module Size (M)** = the narrowest bar or gap in a bar code
- **Broad bar or gap (Z_B)** = Broad bars or gaps are always a multiple of the module. Module x Ratio = Z_B (Normal Ratio 1:2.5)
- **Length of the bar code (L)** = the length of the bar code including start/stop character (in mm). Depending on definition, the quiet zone must be added or not.
- **Length of a bar (in mm) (S_L)** =

The bar code structure consists in general of following items. Any 1D bar code structure starts with the quiet zone followed by the start character. To secure a correct decoding of a bar code the quiet zone is essential and must be without any disturbing markings. It is recommended to have a quiet zone of at least 10 times the module width, with a minimum of 2.5 mm.

The start character is unique and together with the stop character the reading orientation can be defined as well as the code type. Start and stop character are different from each other. An exception to this rule is the EAN-code which has the same start and stop character. Some bar codes do not have a start and stop character, e.g. the pharma code. Optionally bar codes can have a checkdigit, which increases to the correct decoding of the bar code. The checkdigit is then compared to the calculated sum of the scanner and the result will create an output if the read and calculated checkdigit are equal.



Commonly used 1D bar code types are:

Code 2/5 Interleaved (most popular mumeric code in the industry)		**Advantages** **Disadvantages**	very high density at low space self checking requires precise print tolerantes (tolerance ± 10%) simple decoding algorithm ➔ a control character or a fixed length is recommended
Code 39 (first alphanumeric code; widely used in wholesaling and in industry)		**Advantages** **Disadvantages**	self checking secure and accurate coding alphanumeric characters low information density low tolerances (± 10%)
Code EAN 128 (standardised as a logistics code for retail applications))		**Advantages** **Disadvantages**	self checking high information density secure and accurate coding alphanumeric ASCII cgaracter set low tolerances (four-width code) consecutive code 3 data sets necessary in order to code ASCII table

The history of bar codes:

In 1948 **Bernard Silver**, a graduate student at **Drexel Institute of Technology** in **Philadelphia**, Pennsylvania, US overheard the president of the local food chain, **Food Fair**, asking one of the deans to research a system to automatically read product information during checkout.[1] Silver told his friend **Norman Joseph Woodland** about the request, and they started working on a variety of systems. Their first working system used **ultraviolet** ink, but the ink faded too easily and was rather expensive.[2][3]

Convinced that the system was workable with further development, Woodland left Drexel, moved into his father‘s apartment in Florida, and continued working on the system. His next inspiration came from **morse code**, and he formed his first bar code from sand on the beach. “I just extended the dots and dashes downwards and made narrow lines and wide lines out of them.”[2] To read them, he adapted technology from optical soundtracks in movies, using a 500-watt incandescent light bulb shining through the paper onto an RCA935 **photomultiplier tube** (from a movie projector) on the far side. He later decided that the system would work better if it were printed as a circle instead of a line, allowing it to be scanned in any direction.

On 20 October 1949 Woodland and Silver filed a patent application for “Classifying Apparatus and Method“, in which they described both the linear and **bullseye** printing patterns, as well as the mechanical and electronic systems needed to read the code. The patent was issued on 7 October 1952 as US Patent 2,612,994. In 1951, Woodland moved to **IBM** and continually tried to interest IBM in developing the system. The company eventually commissioned a report on the idea, which concluded that it was both feasible and interesting, but that processing the resulting information would require equipment that was some time off in the future.

IBM offered to buy the patent, but its offer was not high enough. **Philco** purchased their patent in 1962 and then sold it to **RCA** sometime later.[2]

Currently bar codes are used in many different applications and forms and are commonly and worldwide used. Some companies are using uniquly designed bar codes to increase the brand recognition.

References:

1. *Fishman, Charles (1 August 2001). “The Killer App – Bar None”. American Way. Archived from the original on 12 January 2010. Retrieved 2010-04-19.*
2. *Seideman, Tony, „Barcodes Sweep the World“, Wonders of Modern Technology*
3. *Seideman, Tony (Spring 1993). „Barcodes Sweep the World“. AccuGraphiX / History of Bar Codes. Archived from the original on 5 November 2016. Retrieved 5 November 2016. Article published in Wonders of Modern Technology, Spring 1993.*

Switching Sensors
Optical Sensors
Ultrasonic Sensors
Fiber Optic Sensors
Inductive Switches
Forked Sensors
Light Curtains
Special Sensors

Measuring Sensors
Distance Sensors
Sensors for Positioning
3D Sensors
Light Curtains
Forked Sensors

Products for Safety at Work
Optoelectronic Safety Sensors
Safe Locking Devices, Switches and Proximity Sensors
Safe Control Components
Machine Safety Services

Identification
Bar Code Identification
2D-Code Identification
RF Identification

Data Transmission/ Control Components
MA Modular Connection Units
Data Transmission
Safe Control Components

Industrial Image Processing
Light-Section Sensors
Smart Camera

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