



CeraCode® - Unique part ID in press hardening

CeraCode® provides clear machine identification of each individual component from the raw material to the end product - seamless, reliable, durable, cost-efficient and trackable through every stage.

Dr. Christoph Kroh, Founder / CTO

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From ceramic pigments to ultra-durable, machine-readable codes - the individual fingerprinting innovation for hot formed metal parts

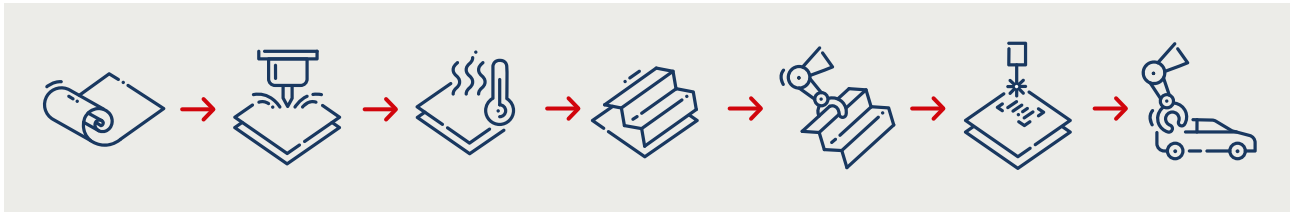
Millions a year are often lost in just one plant through sorting, rejection and recall costs that could be avoided with an individual part identification system to provide gapless digitalization of the production processes in press hardening and hot forming. In four scenarios, this whitepaper illustrates how the novel, CeraCode® part-marking solution provides seamless tracking and tracing in production lines by marking every part with a unique fingerprint ID code, resulting in significant cost reductions of hot formed, body-in-white parts.

The individual marking of components (direct part marking) plays a central role in the progressive digitalization of production. It enables the clear machine identification of all components from the raw material to the end product. However, there is the remaining challenge of continuous marking in metal processing - especially in harsh production environments with temperatures between 700°C and 1,200°C (1,300-2,200°F) where common marking solutions fail.

Press hardening is a hot stamping, production process in which forming and heat treatment (over 900°C/1,650°F) are carried

out in a single process step. In the automotive industry, press-hardened components are used primarily in the body-in-white construction and are characterized by high strength (= crash performance) combined with low weight.

To be able to identify components in this process, conventional numbers and character strings are currently stamped into the sheet metal with so-called "layer stamps", due to a lack of alternative marking methods. The major disadvantage of layer stamps is the inability to mark individual components and codes being not machine readable. As a result, the components made in one production shift or a full production week are marked with the same number, which could be used for as many as 40,000 components. As a result, there is no single-part identification and no combination of process and part data, resulting in a gap in the digitalization of the production and high costs due to sorting, rejects and recalls. All in all, those events can lead to costs of several million euros per year for a Tier 1 supplier or OEM.



Business Customer promises with CeraCode®

With CeraCode®, these problems are solved, and gapless process digitalization can be achieved with single-part tracking and tracing in press hardening. The CeraCode® solution can be placed directly in front of the oven or on the cutting machines and can simply replace the current standard setups of layer stamps. The process time of the marking and scanning of the part number or the code has a process time of only about one second. Furthermore, multiple parts can be marked simultaneously, each with its own fingerprint ID code, by using a

multi-printer-system. After the marking, the parts can go directly into the heating and forming process and the code can be read automatically again after the hot forming and also at every other process step in the production chain.

The "all-in-one" concept for heat-resistant, marking and identification provides full connection of component and process data, significant savings in production, improvements in quality control and a full digital optimization of production processes.



fewer rejections, less recall and sorting costs



fewer failures due to process optimization



no risks caused by surface damage



optimization of process windows



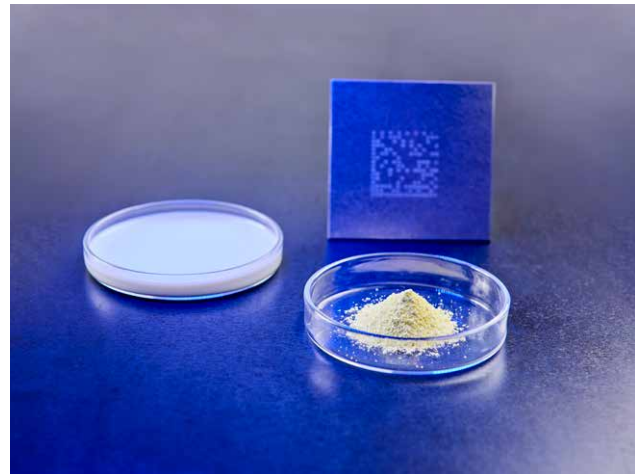
full digitalization of the production

The “all-in-one” concept for rugged, heat-resistant marking and identification

The “all-in-one” concept for high-temperature-resistant marking, identification and digitalization of metal components consists of a robust industrial printer including an ink supply, a unit consisting of a scanner and lighting for code registration, and a controller with data processing.

The components are printed with a heat-resistant ceramic ink that was specially developed for this purpose. This ink is printed on the component as a machine-readable Data Matrix Code (DMC) using standard, industrial print heads. The ultra-fast printing takes place without delaying the production process. The applied matrix code bonds firmly to the component, resists the highest temperatures, is insensitive to chemical influences and does not influence subsequent production processes.

The code is scanned during printing as well as during further production steps along the process chain. Its content and print quality are evaluated and transmitted into the user’s information systems via industry-standard interfaces. For the users, this leads to a full control of their production and maintenance cycles as every component has its own unique fingerprint ID code.



Years of development work, chemical and physical tests and continuous practical use have shaped the development of CeraCode®. Our ink and the process technology derived from it is “engineering made in Germany” with the high aspiration to fully solve your problems in the area of marking hot-formed metal components.

Why CeraCode® - Comparison to other solutions

Since the solutions currently available on the market for industrial marking (printing with conventional ink, punching or laser engraving) cannot withstand heating to over 900 °C (1,650 °F), the semi-finished products are marked after the process step of press hardening and thus cannot be individually identified until very late in the production processes. Plus punching and

laser engraving damage the surface of the component which could result in rusting. Compared to these current, state-of-the-art, marking solutions, CeraCode® outperforms with its high temperature resistance, machine readability, its short cycle times and no surface damage.



CeraCode®

- + High contrast
- + No loss of time
- + Permanent, individual
- + No surface damage
- + High temperature resistant
- + Machine readable
- + All-in-one solution
- Consumables necessary



Punching

- + Permanent
- + No consumables
- No individual marking
- Not machine readable
- High maintenance
- Low contrast
- Surface damage



Laser engraving

- + Permanent
- + No consumables
- Surface damage
- High investment costs
- High security standards
- Contrast can vary

Where CeraCode®'s unique fingerprinting ID technology delivers - Four scenarios

In process and quality control in a press hardening plant, several scenarios can occur that require further quality processes or can cause high costs like sorting, detailed measurement, rejection or recall costs. Particularly in plants with several press hardening

lines, costs in the seven-digit range can arise quickly. In all the scenarios described below, customers can avoid high costs with CeraCode®:



Quelle: <https://www.flickr.com/photos/gestamp/31520326091>



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Saving resources through reducing scrap

A Tier 1 supplier or OEM with four production lines has fifteen events per year per production line where internal production failures are recognized. For every event, 50% of a shift batch must be sorted and checked for failures. In some events, a sorting may not be feasible due to higher efforts and costs in comparison to a re-production of the batch, leading to scraps. The overall costs of this internal sorting and/or re-production may amount to several hundred thousand euros per year.

With the CeraCode® solution, a complete digital connection of process and component data is possible. Through this connection, production conditions can be precisely determined at any time and on any component so that critical events can be detected at an early stage. This leads to a reduction in sorting and scrap costs of over 50%.

Decreasing sorting costs due to higher quality

A Tier 1 supplier with four production lines has 60 total batches per year where production failures are noticed, not internally, but at the OEM after delivery of the parts. On every event, 50% of a shift batch must be sorted and checked for failures at the OEM. Therefore, the OEM commissioned an external company with an hourly rate of 120 € per worker. With a handling of 5-10 minutes per part, the total costs per year can again add up to a few hundred thousand euros per year.

The CeraCode® solution and its single-part tracing is the key to a full recognition of process parameters and process windows where failure conditions can be tracked and assigned to drastically smaller batch sizes. With the resulting smaller batches, a 50-70% reduction in sorting and associated costs can be achieved.



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Optimizing of production parameters by digitalization

Even today, machine and process data are collected and used in modern plants to be able to determine problems or maintenance intervals. However, in complex value chains consisting of several process steps, this data cannot be fully utilized, which limits the optimization of processes. One reason for this is the lack of a link between production and machine data due to missing component marking and mapping of the production volume that is only based on estimates. The consequences of this are for example unclear maintenance cycles, unplannable tool changes and line stoppages that can amount to avoidable total costs of several hundred thousand euros per year.

CeraCode® enables the connection of component, process and machine data and allows a digital twin not only of individual machines but also of all components and thus entire production chains. By closing the gap in digitalization, line downtimes and maintenance can be planned and minimized and high costs avoided.



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Becoming a reliable supplier based on best performances

Increased complaints or a significant reduction in your delivery performance can have a massive impact on your future business relationship with your customer. In the event of possible new business opportunities, a purchasing department will surely not consider a supplier who is known for poor delivery performance. It is also possible that your customer will give you the status “new business on hold”. Possible violations of your contractual agreements, such as exceeding the agreed ppm-rate, can also have a negative impact on your business success.

CeraCode® will support you in the sustainable fulfillment of your contractual obligations and thus secures your business success in the long term.

If an anticipated scenario is not included or you want to see how CeraCode®'s unique fingerprinting ID technology can help you, please contact us directly on info@senodis.io. For the digital printout of the whitepaper please go to www.senodis.io/en/lp/getintouch or scan the QR-code below.



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**Keep track of each
press hardened metal
part with CeraCode®**