# In the SPOTLIGHT:

## LASER MARKING OF S³P-TREATED SURFACES

Whether annealing, remelting or engraving: laser marking ensures that components made of corrosion resistant steel can be securely traced. Not only in medical technology, where the traceability of instruments, implants or bone screws is paramount, laser marking offers considerable advantages over methods such as printing or etching. Despite fast marking speeds, the process combines precision, quality and reproducibility. Furthermore, the laser offers sufficient flexibility for variable markings and small batch sizes.

SPOTLIGHT

## S³P – Specialty Stainless Steel Processes
## Laser Marking

For many applications a pivotal question is, if S³P-hardened components are suitable for laser marking and if marking before or after S³P should be prefered. Regarding S³P-hardened components, the corrosion resistance of the base material can be maintained, if components are marked before hardening, but optimally-adjusted process and additional reworking may be necessary.

## Hardening corrosion resistant steels

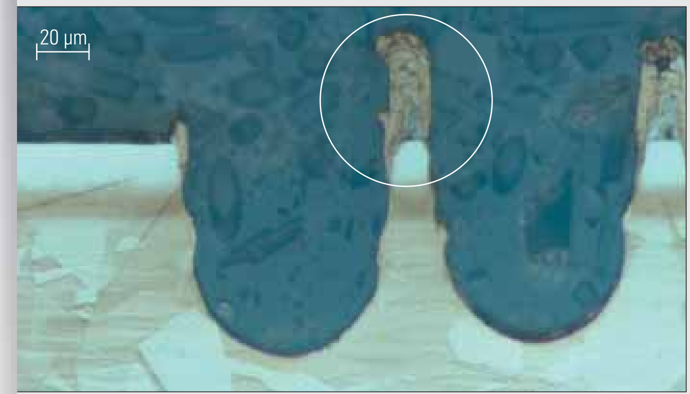
The surface-hardening processes of Bodycote S³P (Specialty Stainless Steel Processes) are based on the interstitial supersaturation of carbon or nitrogen in the base microstructure. Particularly low treatment temperatures suppress the precipitation of carbides and nitrides, and free chromium is available to form the passive layer. A controlled low input of heat is thus essential for laser marking.

## Mark first, then S³P

The problem of the energy input of the laser leading to tempering colours or precipitations of nitrides and carbides is best avoided during the manufacturing process. This means that the finished component is marked with the laser and hardened afterwards. In-house tests on 1.4404 even indicated an improvement in the corrosion resistance of laser-remelted and hardened surfaces compared with the untreated reference sample.

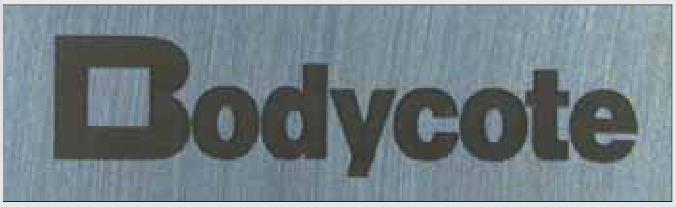
If subsequent marking is inevitable, the parameters should be selected to ensure a homogeneous and precipitation-free surface. For example, in addition to significant roughening of the surface in the heat input zone, laser engraving may result in precipitations. Laser annealing also prevents from a homogeneous passive layer created by the formation of oxides. In both cases subsequent passivation is recommended.

Depending on the application and hardening process, laser engraving, remelting and annealing marking could all represent the best solution. The specialists at Bodycote S³P would be happy to support you choose the right process.

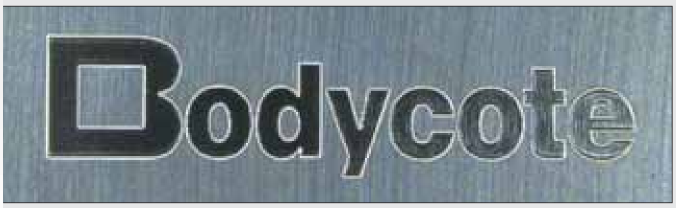



*Subsequent laser engraving of a S³P-treated component; the selective removal of the diffusion zone is visible in the microsection. Solidified spatter on the surface should be removed.*


*Subsequent laser engraving of an S³P-treated component; spatters and tempering colours on the surface. (Parameters: P 20 W/ 50 %/ $f_P$ 32 kHz/ $t_P$ 144 ns/ $E_P$ 0.63 mJ/ $v_s$ 1.3 $ms^{-1}$)*




*Subsequent laser annealing of an S³P-treated component; dark oxides on the surface can impair the corrosion resistance. (Parameters: P 8 W/ 50 %/ $f_P$ 140 kHz/ $t_P$ 20 ns/ $E_P$ 0.16 mJ/ $v_s$ 0.05 $ms^{-1}$)*




*Subsequent laser remelting of a S³P-treated component; relatively low contrast simultaneously with positive corrosion properties. (Parameters: P 20 W/ 50 %/ $f_P$ 200 kHz/ $t_P$ 60 ns/ $E_P$ 0.37 mJ/ $v_s$ 0.8 $ms^{-1}$)*



Bodycote
www.bodycote.com
*S3P@bodycote.com*

03.2016/EN 422-1684