oerlikon
balzers

Stainless & Hard

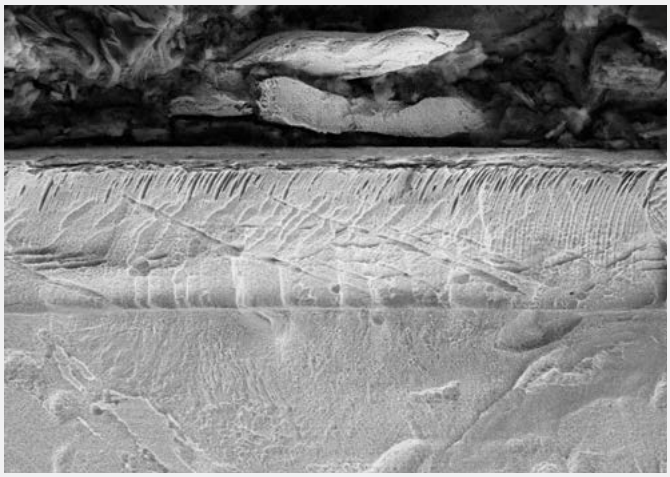
BALITHERM IONIT ST treatment for austenitic steels for food processing industries

General Engineering

BALITHERM IONIT ST – an alternative to carburising for stainless steel

Corrosion-resistant surface hardening of austenitic stainless steel

- Nitrogen diffusion process with no formation of chromium nitride precipitation
- Hardness: 1,000 - 1,200 HV0.1
- Diffusion depths: 5 – 30 µm, depending on the material and treatment time
- High wear resistance
- High corrosion resistance
- Practically no dimensional change
- Typical steels: 1.4301; 1.4401; 1.4404



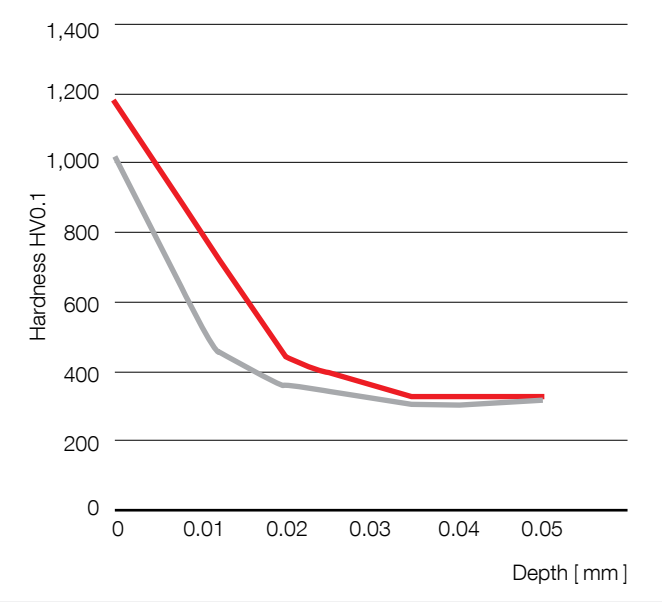
SEM photo of cross section of BALITHERM IONIT ST, showing a standard 20 µm thick diffusion zone on a DIN 1.4301 steel

Hardness profile surface treated with Balitherm® Ionit ST versus a standard carburised surface

Material: steel 1.4301

BALITHERM® IONIT ST achieves 1,200 HV while carburising achieves just 1,000 HV

BALITHERM® IONIT ST
Carburised



BALITHERM® IONIT ST is a low-temperature diffusion process

It achieves a dense diffusion zone with no nitride precipitation, ensuring retention of corrosion resistance, high hardness and a graduated hardness profile.

BALITHERM IONIT ST – a reliable diffusion process for austenitic stainless steels

Food processing and other industries use austenitic stainless steel for mechanical components. This type of steel provides excellent corrosion resistance, but has the significant disadvantage of low hardness (approx. 250 HV). Consequently, they offer low wear resistance, both against particles (abrasion) and when sliding against another stainless steel component (adhesive wear, galling).

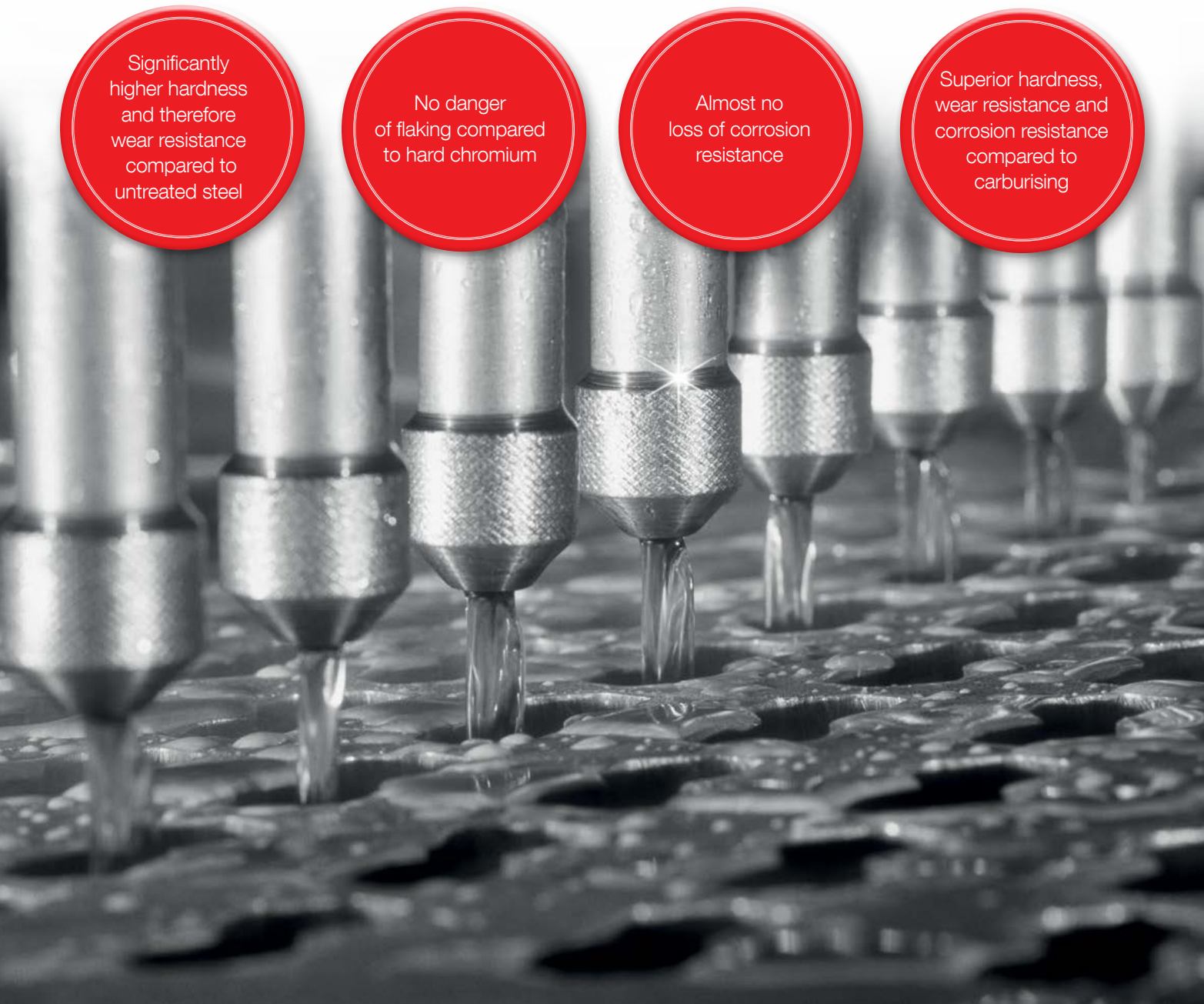
Frequently, hard chrome plating is used to improve the wear resistance. Hard chrome plating is prone to flaking off under severe load conditions or due to coating process failures.

Diffusion treatment can be considered as an alternative. Unfortunately, it is very difficult to nitride austenitic stainless steel, especially at the low temperatures, which are required in order to prevent a reduction of the steel's corrosion resistance. One solution already on the market is a carburising process.

Oerlikon Balzers is now introducing a powerful alternative: the BALITHERM® IONIT ST process, in which nitrogen at low temperatures is diffused into austenitic steel.

Your advantages using austenitic steel parts treated with BALITHERM IONIT ST

- Significantly higher hardness and therefore wear resistance compared to untreated steel
- No danger of flaking compared to hard chromium
- Almost no loss of corrosion resistance
- Superior hardness, wear resistance and corrosion resistance compared to carburising

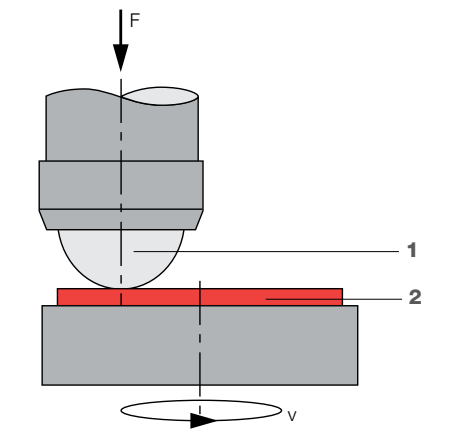


BALITHERM IONIT ST – friction and wear

High sliding wear resistance

Measurement conditions

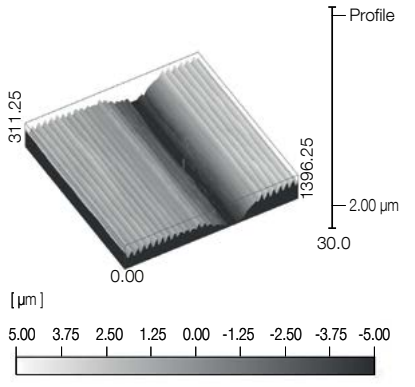
Method	pin (1) and disc (2)
Load	10 N
Distance	1,000 m
Speed	30 cm/s
Temperature	20 °C
Humidity	43%
Counterface	steel ball, 100Cr6, 3 mm



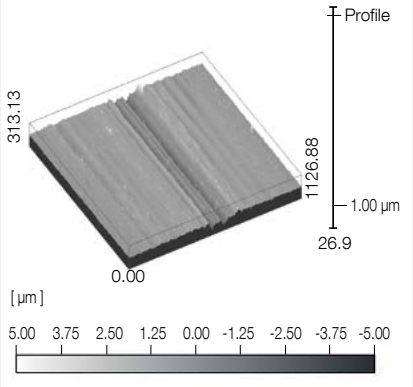
Result

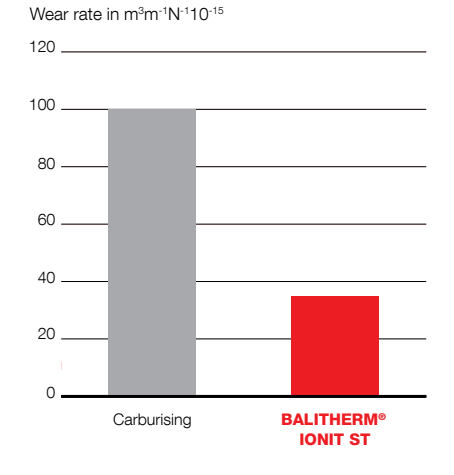
BALITHERM® IONIT ST delivers significantly higher sliding wear resistance than the carburising process

Carburising
100 $m^3m^{-1}N^{-1}10^{-15}$

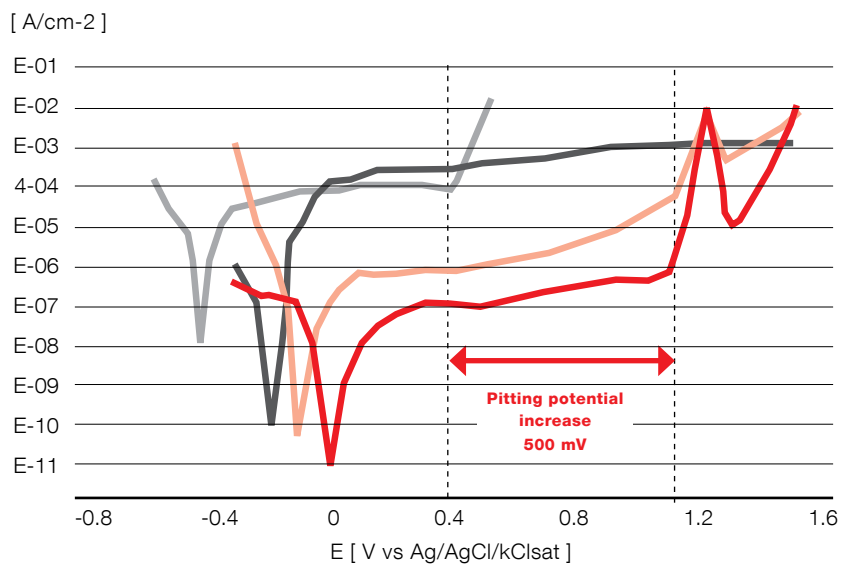


BALITHERM® IONIT ST
32 $m^3m^{-1}N^{-1}10^{-15}$





Excellent corrosion resistance



Reference (1.4301)
IONIT ST long
IONIT ST short
Carburising

The measuring shows an improvement of the pitting behavior in comparison to an untreated 1.4301 sample.

BALITHERM IONIT ST – application examples

Powerful in food processing

BALITHERM® IONIT ST is used in bottling and filling applications where either metal sliding wear or media particle wear must be prevented.

Seizure of a 1.4301 marmelade filling plunger which **could be prevented with BALITHERM® IONIT ST treatment.**

Other applications: candy and medical tablet punches.

BALITHERM IONIT ST – analytical results

Food acceptance analysis

BALITHERM® IONIT ST is qualified for direct contact with food.

Within the scope of the analysed parameters, it has been ascertained that the material qualifies for prolonged direct contact with food. The results indicate that the material remains unaltered after exposure to the representative solutions.

Certified by Institut Prof. Kurz GmbH, Cologne, 2015

Chemical results

Representative solution	Reaction
Aqua dem.	No peculiar reaction
Acetic acid (CH_3COOH, 3%)	No peculiar reaction
Acetic acid (CH_3CH_2OH, 15%)	No peculiar reaction
Vegetable oil	No peculiar reaction

Migration analyses of substances into food with 4 representative solutions: (Methods ASU § 64 LFGB B-80.30-2 EG, RL 82/711/EWG)

Mechanical properties

	BALITHERM® IONIT ST
Surface treatment	Nitrogen diffusion zone
Micro hardness (HV0.1)	1,000 - 1,200
Typical thickness	10 - 20 µm
Colour	Silver grey

Open a new world of possibilities with BALITHERM IONIT ST
Contact us today!

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