Creusabro® Advanced Impact and Abrasion Resistant Steels

Unique – Better – Proven

Creusabro steels are genuinely different than classical low-alloyed martensitic abrasion resistant plates.

Fine dispersion of hard Ti, Cr, Mo alloyed carbides, which enhance the resistance to slide abrasion, produce a uniform through-hardened plate and low level of residual stresses

When in service, Creusabro steels strongly improve their wear resistance by a surface hardening effect of about +70HB caused by impact with rocks or pressure by the abrasive particles

As a result, an optimum combination of wear resistance and processability, for the most severe operating conditions, as hardness alone does not guarantee increased wear resistance.

Creusabro steels are designed to provide a cost-effective combination of wear resistance and easy fabrication.

The moderate hardness in the as-delivery condition facilitate smooth and easy processing of complex parts at the workshop, without compromising on the wear resistance in service conditions.

Vulcan introduced Creusabro wear material to the Australian iron ore industry in the Pilbara region over 15 years ago, and since then the usage of Creusabro has significantly expanded Australia wide. Acceptance in many areas, including both fixed and mobile plant applications and a range of industrial applications, is due to the proven and substantial service life improvements achieved in the original in-service tests, and in new applications since, resulting in significant cost saving benefits to plant maintenance budgets.

Vulcan currently offer 3 grades of Creusabro wear plate

- **C4800 (400 HB)**
- **C8000 (500 HB) and**
- **CDual (500 HB, 550 HB)**





Both the C4800 and C8000 grades are ideal where conventional water quenched 400HB and 500HB wear plates are used. Both grades are well suited to impact and have shown up to 50% increase in wear life over standard water quenched and tempered plate.

Creusabro Dual is a new, advanced high performance grade and has been developed for severe impact and high sliding wear conditions, predominately where weld overlay and white iron plates have traditionally been used.

Industries and Applications

Mining

Excavating and Bulk Handling, including bucket liners, wear bars and cutting edges, dump truck tray liners, Crushing and Screening, including grizzly caps, chute liners and impact plates.

Quarries

Bucket wear kits, cutting edges, crusher liners.

Other Industrial Applications and Hot Conditions

Including Power, Iron and Steel, Cement Plants, Demolition and Recycling.

Creusabro® DUAL

High performance impact-abrasion wear resistance steel

Creusabro Dual is a new, advanced, high performance grade of abrasion resistant steel dedicated to severe impact and sliding wear conditions in service. Thanks to its outstanding wear resistance, use can be considered in applications where conventional water quenched steels (500HB, 550HB), hard faced plates, or cast wear parts are traditionally used.

Creusabro Dual advanced properties have been created using an innovative metallurgical concept, based on a unique combination of chemical analysis and heat treatment procedures (oil quenching), which reduces the level of residual stresses encountered with drastic quenching methods such as water.

This confers to Creusabro Dual an outstanding extra wear resistance, a strong resistance in extreme impact and sliding conditions and a very efficient work hardening capability in service.

No other steel offers such high wear and abrasion resistance at this level of hardness (500HB), combined with high resistance to cracking in service.

Metallurgical concept

Abrasion and wear resistance is not exclusively connected to the hardness of the steel in the as delivered condition, but also depend on other properties including crack resistance, work hardening, strength, ductility, softening resistance, etc. It's chemical composition and micro structure also strongly influence its performance.

When entering into service Creusabro Dual takes advantage of a surface hardening effect of about 70 HB, whatever the applied strain level is (impact, pressure...) This combination of properties makes it most effective to withstand both abrasion and heavy impact service.

Titanium carbides

By utilising extremely hard titanium carbides, a strong resistance in severe sliding conditions has been achieved. These carbides can reach a hardness of 3000HV and therefore creates numerous hard deposits in the steel matrix of Creusabro Dual like gravel in concrete.



Standard sizes - (mm)	Thickness (mm)
2500 x 8000 mm	10 mm - 30 mm
2500 x 4000 mm	40 mm - 50 mm

Chemical Analysis (Indicative values weight %)

C	Mn	Ni	Cr	Mo	S	Ti
≤ 0.40	≤ 1.30	≈ 0.45	≈ 0.70	≤ 0.34	≤ 0.002	≤ 0.60

Mechanical properties (typical values)

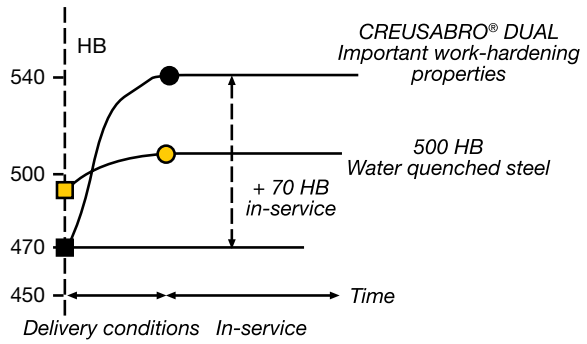
Hardness	YS 0.2	UTS	El.	KCVL-20°C	E
HB	MPa	MPa	%	J/Cm²	GPa
480	1200	1630	10	168	205

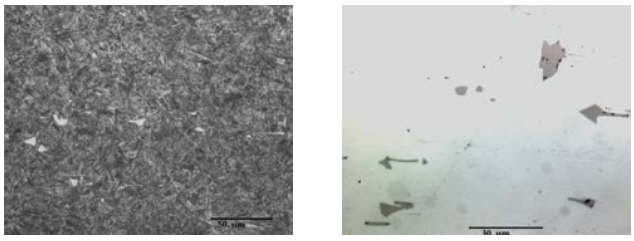
Indicative values (as delivered)
Hardness: 430/520 HB

Physical properties – expansion coefficient (x 10^{-6}.°C^{-1})

20/100°C	20/200°C	20/300°C	20/400°C	20/500°C
11.2	12.0	12.5	13.2	13.8

Density at + 20°C: 7.85 kg/dm³





Extremely hard titanium carbides inserted into the steel.

Creusabro Dual will extend service life, whatever service conditions are. This extended service life is especially relevant for extreme applications where severe abrasion conditions are combined with high impact, heat, or moderate corrosion.

Creusabro® 8000

High performance wear resistant steel

Creusabro 8000 is a high performance wear resistant steel, exhibiting a wear resistance 50% higher than that of conventional 500 HB water quenched steel.

Properties of Creusabro 8000 are improved as a result of the combination of an enriched analysis (chromium, molybdenum and titanium) and specific heat treatment procedures. (oil quenching). This confers to Creusabro 8000 an improved high wear resistance and a very good aptitude for processing, far better than other 500HB water quenched steels. Creusabro 8000 offers the best possible optimization of an exceptional wear resistance and very acceptable workability.

Metallurgical concept

Abrasion resistance is not exclusively connected to the hardness of the steel in the as delivered condition. Its components and its structure strongly influence its performance. Chemical balance and manufacturing processes of Creusabro 8000 impart a metallurgical structure to the steel which strongly improves its wear resistance by taking advantage of a surface hardening effect of about 70 HB, whatever the applied strain level is (impact, pressure, etc).

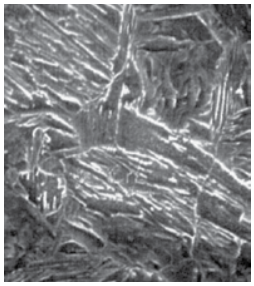
TRIP effect...

TRansformation **I**nduced by **P**lasticity

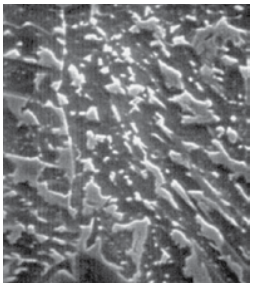
Creusabro 8000 has the capability to work-harden in service by local plastic deformations transforming retained austenite into very hard fresh martensite, which increases wear resistance. The “TRIP” effect also contributes to the delay of chip removal from the steel under the action of abrasive particles.

Fine dispersion of micro carbides

The fine structure of Creusabro 8000 is obtained by a fine dispersion of micro-carbides, just the opposite of the rough acicular lamellar structure typical of 500HB water quenched steels.



500HB water quenched steel



Creusabro 8000



C8000 tray liner kit.

Standard sizes - (mm)	Thickness (mm)
2500 x 8000 mm	5 mm - 40 mm
2500 x 4000 mm	50 mm - 100 mm

Chemical Analysis (Indicative values weight %)

C	Mn	Ni*	Cr	Mo	S
≤ 0.28	≤ 1.30	≈ 0.04	≤ 0.70	≤ 0.20	≤ 0.002

* for widths over 2500 mm, Ni ≈ 1.25

Mechanical properties (typical values)

Hardness	YS 0.2	UTS	El.	KCVL-20°C	E
HB	MPa	MPa	%	J/Cm²	GPa
470	1250	1630	12	55	205

Indicative values (as delivered)
Hardness: 430/500 HB
Toughness: KCVL -20°C ≥ 40 J/cm², -40°C ≥ 30 J/cm²,

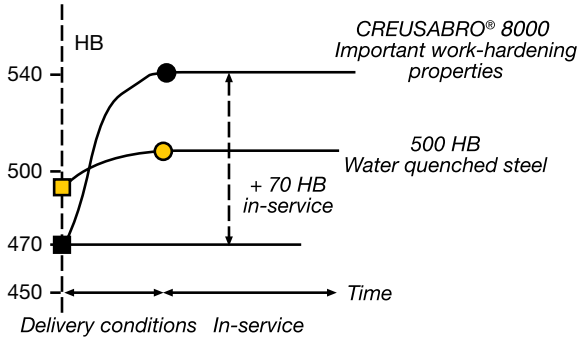
Hot mechanical properties (indicative values)

YS MPa UTS			UTS MPa		
200°C	400°C	500°C	200°C	400°C	500°C
1080	880	520	1650	1250	900

Physical properties – expansion coefficient (x 10^{-6}.°C^{-1})

20/100°C	20/200°C	20/300°C	20/400°C	20/500°C
11.2	12.0	12.5	13.2	13.8

Density at + 20°C: 7.85 kg/dm³



Creusabro® 4800

High performance wear resistant steel

Creusabro 4800 is a high performance wear resistant steel, exhibiting a wear resistance 50% higher than that of conventional 400 HB water quenched steel.

Properties of Creusabro 4800 are improved as a result of the combination of an enriched analysis (chromium, molybdenum and titanium) and specific heat treatment procedures. (oil quenching). This confers to Creusabro 4800 an improved high wear resistance and a very good aptitude for processing, far better than other 400HB water quenched steels. Creusabro 4800 offers the best possible optimization of an exceptional wear resistance and very acceptable workability.

Metallurgical concept

Abrasion resistance is not exclusively connected to the hardness of the steel in the as delivered condition. Its components and its structure strongly influence its performance. Chemical balance and manufacturing processes of Creusabro 4800 impart a metallurgical structure to the steel which strongly improves its wear resistance by taking advantage of a surface hardening effect of about 70 HB, whatever the applied strain level is (impact, pressure...).

"TRIP effect": TRansformation Induced by Plasticity

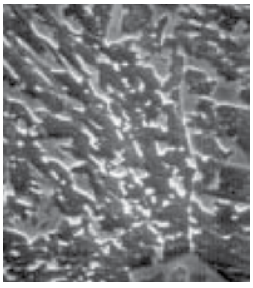
Creusabro 4800 has the capability to work-harden in service by local plastic deformations transforming retained austenite into very hard fresh martensite, which increases wear resistance. The "TRIP" effect also contributes to the delay of chip removal from the steel under the action of abrasive particles.

Fine dispersion of micro carbides

The fine structure of Creusabro 4800 is obtained by a fine dispersion of micro-carbides, just the opposite of the rough acicular lamellar structure typical of 400HB water quenched steels.



400HB water quenched steel



Creusabro 4800



C4800 bucket assembly.

Standard sizes - (mm)	Thickness (mm)
2500 x 8000 mm	5 mm - 40 mm
2500 x 4000 mm	50 mm - 100 mm

Chemical Analysis (Indicative values weight %)

C	Mn	Ni	Cr	Mo	S	Ti
≤ 0.20	≤ 1.60	≈ 0.20	≤ 1.90	≤ 0.40	≤ 0.005	≤ 0.20

Mechanical properties (typical values)

Hardness	YS 0.2	UTS	El.	KCVL-20°C	E
HB	MPa	MPa	%	J/Cm²	GPa
370	900	1200	12	45	205

Indicative values (as delivered)
Hardness: 340/400 HB
Toughness: KCVL -20°C ≥ 30 J/cm²

Hot mechanical properties (indicative values)

YS MPa UTS			UTS MPa		
200°C	400°C	500°C	200°C	400°C	500°C
940	920	820	1220	1120	900

Physical properties – expansion coefficient (x 10^{-6}.°C^{-1})

20/100°C	20/200°C	20/300°C	20/400°C	20/500°C
12.4	13.1	13.9	14.4	14.7

Density at + 20°C: 7.85 kg/dm³

