Creusabro®

Industeel ArcelorMittal

CREUSABRO ® 8000

Creusabro® 8000 is a high-performance, wear-resistant steel that surpasses conventional 500HB water-quenched steel in wear resistance by 50%. This superiority is achieved not only through high hardness but also by incorporating an enriched alloying content (chromium, nickel, molybdenum, and titanium) and employing specific heat treatment procedures.

In its as-delivered condition, Creusabro® 8000 exhibits moderate hardness, facilitating processing operations like cutting, machining, and forming, making it significantly more manageable than ordinary water-quenched steels.

During service, Creusabro® 8000 further enhances its wear resistance due to a surface hardening effect of approximately +70 HB. This is attributed to local plastic deformations resulting from impacts with rocks or pressure from abrasive particles.

Creusabro® 8000 finds ideal applications in mining, quarries, cement and steelmaking industries, as well as public works and agricultural machinery. In demanding sectors like mining and earthmoving, its heightened resistance to wear and impact abrasion extends the service life of wear parts and components compared to conventional water-quenched steels. Consequently, substantial cost-saving benefits are realized within plant maintenance budgets.

This grade is suitable for various types of abrasion, sliding or impact, in both dry and wet environments, including operating temperatures up to 450°C.

Hardness	470 HB (Guarantee 430 - 500 HB)
Mechanical properties Typical value	Rp 0.2 : 1250 MPa Rm : 1630 MPa A% : 12
Resilience Typical value, th.20 à 100mm	Energie d'impact 50J à -40°C Garantie 27J à -20°C

Chemical composition

Typical value

C (Max %)	S (Max %)	P (Max %)	Mn (Max %)	Ni (Max %)	Cr (Max %)	Mo (Max %)
≤ 0.28	≤ 0.005	≤ 0.018	≤ 1.6	≤ 1.0	≤ 1.6	≤ 0.40

Physical properties

Density at +20°C (68°F) = 7.85kg/dm3 | Expansion coefficient - average (10-6/°C)

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

153 Rue Aristide berges 73000 CHAMBERY
Numéro SIREN : 788137461
Numéro SIRET : 78813746100042
Numéro TVA Intracommunautaire : FR50788137461

PRODUR ENGINEERED BY WELDING ALLOYS

Creusabro®

Industeel ArcelorMittal

Metallurgical concept

Wear resistance depends not only on the hardness of the steel in the as delivered state, but also on the other properties, such as crack resistance, work hardening, strength, ductility, softening resistance, etc. The performance in service of given wear resistant steel is strongly influenced by the microstructure obtained after thermal processing.

In the case of Creusabro® 8000 , a significant improvement of the wear resistance in service is mainly due to the following properties:

«TRIP effect»: TRansformation Induced by Plasticity

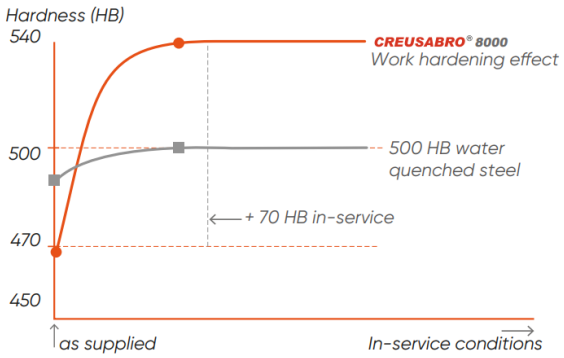
Thanks to its initial structure, which is not fully martensitic (a combination of martensite, bainite, and retained austenite), Creusabro® 8000 demonstrates the capacity to work-harden when subjected to local plastic deformation during service. This process of plastic deformation triggers a surface hardening phenomenon, where retained austenite transforms into new and highly resilient martensite. Importantly, the material retains its ductility underneath. This unique characteristic makes Creusabro® 8000 exceptionally effective in withstanding both abrasion and heavy impact during its operational life.

Fine dispersion of micro carbides

The fine microstructure of Creusabro® 8000 is a result of a specific chemical composition combined with a controlled cooling rate.

Such a microstructure differs from the rough acicular lamellar structure which is typical of the fully martensitic steels (conventional 500 HB water quenched steels).

Moreover, the fine and homogeneous dispersion of micro carbides significantly contributes to improve the reinforcement of the matrix by improving the sliding wear resistance in service



Creusabro®

Industeel ArcelorMittal

500 HB water quenched steel Conventional route Passive steel	Creusabro® 8000 Alternative route Active steel
- Restricted alloy elements (mainly C, Mn, B) - Drastic water quenching - Fully martensitic structure	- Specific chemical composition - Controlled cooling - Martensite + bainite + retained austenite - Perfect balance: high wear resistance + improved workability - Wear resistance in service is a combination of: - work-hardening (TRIP effect) - Presence of micro-carbides (chromium, molybdenum, titanium) - Delayed tearing of metal particles (super-ductility of the retained austenite).
Wear resistance in service is a result of the hardness in the as delivered state. It is an answer for common applications	Creusabro® 8000 is an answer for specific applications.

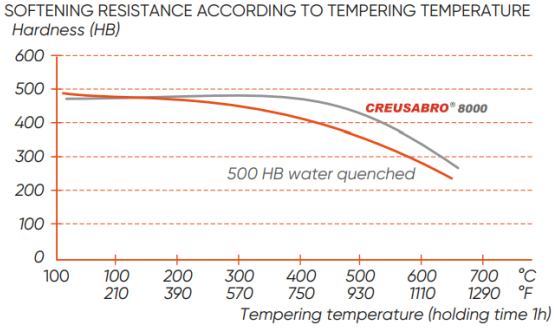
Properties At High Temperature

The chemical composition of Creusabro® 8000, particularly its chromium, molybdenum, and titanium content, imparts high softening resistance to the material.

Such a quality allows using Creusabro® 8000 in hot service conditions, with a maximum operating temperature of 450°C (840°F). In contrast, conventional 500 HB water-quenched steels are limited to lower temperatures, typically up to 250°C (480°F).

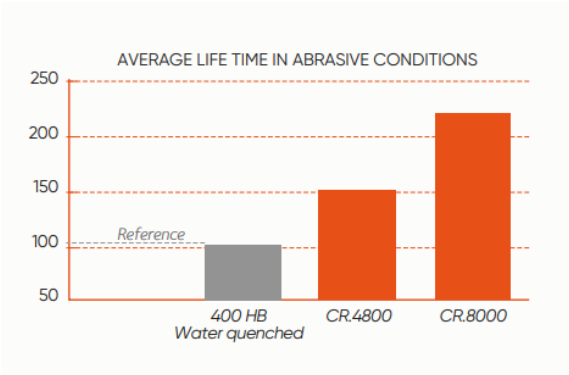
Moreover, Creusabro® 8000 exhibits processing flexibility at high temperatures ranging from 500-550°C (930-1020°F). This includes hot forming processes such as bending and rolling.

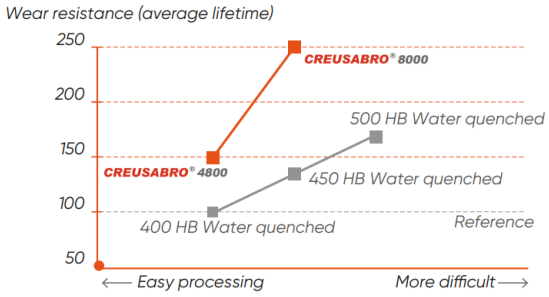
After high-temperature processing, a notable feature is the ability to undergo a slow air cooling process without any significant drop in hardness. The hardness reduction is limited to approximately 30-50 HB.



Service life

Whatever the service conditions, the original metallurgical concept of Creusabro® 8000 confers to the material an improvement of its performance in terms of wear resistance and workability, compared to other conventional 500 HB water quenched steels. Creusabro® 8000 is particularly suitable for extreme applications, when severe abrasion conditions are combined with huge impact, heat or moderate corrosion.





153 Rue Aristide berges 73000 CHAMBERY
Numéro SIREN : 788137461
Numéro SIRET : 78813746100042
Numéro TVA Intracommunautaire : FR50788137461

PRODUR ENGINEERED BY WELDING ALLOYS

Creusabro®

Industeel ArcelorMittal

Yield Strength		
200°C	400°C	500°C
1080	880	520

UTS		
200°C	400°C	500°C
1650	1250	900

Field tests

Many tests were performed in different areas of industries which confirm the high performance of Creusabro® 8000 compared to 500 HB water quenched steels.

Service life versus 500 HB steels			
Areas of industries	Application	Th. Piece	Service life
Mines (gold ore)	Wear parts - External liner of bucket excavator	30mm	+100%
Foundry (handling hot agglomerate	Extracting plates	12mm	+36%
Iron making (iron ore + coal)	Wear parts - Internal chute liner	15mm	+35%
Fertilizer industry	Crushing hammers	15mm	+58%
Wood industry	Pneumatic chip handling (pipe elbows)	12mm	+38%
Glass recycling (calcin)	Belt conveyor (guide plate)	15mm	+69%
Quarry (granite)	Wear parts (internal side of a jaw crusher)	40mm	+50%

Sizes - Tolerances

Product - Thickness	Sizes	Tolerance
3 à 6 mm	1500 x Consultez nous	3 mm/m
5 à 6 mm	2000 x 6000	5mm/m
	2500 x 6000	
	2500 x 8000	

Other sizes - please consult.

Creusabro®

Industeel ArcelorMittal

Mise en Œuvre

Cutting

All classical thermal processes (oxygen - plasma - laser) can be used. Plasma and laser processes are especially recommended, to obtain better precision and cutting aspect and to minimize the extend of the Heat Affected Zone (HAZ).

Whatever process (thermal) is used, following conditions are sufficient to avoid any cold cracking:

Plate temperature	Thickness < 40 mm	Thickness > 40 mm
≥ 10°C	No preheating	Preaheating 150°C (302°F)
< 10°C	All thicknesses: preheating 150°C (302°F)	

Water jet cutting also can be used.
Shearing of thin plates is not recommended

Machining

Milling shall be done with high speed steels HSSCO type (ex. AR 2.9.1.8. according AFNOR, M42 according to AISI) taper shank. Carbide tip drills (K10 or K20 according to ISO) and possibly coated (TiN) shall significantly improve drilling performances in case of medium to large production

Tool	Ø mm	Drillingspeed (m/min)	Revolution Speed (t/min)	Feed (mm/t)
HSSCO AR.2.9.1.8 (M42)	10	4 - 6	125-190	.007
	20		65-95	.10
	30		40-65	.12
Carbide K20	10	18 - 22	575-700	.007
	20		285 – 350	.10
	30		190 - 235	.12

Milling

Shall be done with HSSCO tools (AR.6.5.2.5. according to AFNOR, M35 according to AISI or AR.12.0.5.5/T15). A better efficiency will be obtained with carbide tips P10/P30 (rough machining) or K10/K20 (finishing).

Tool	Depth (mm)	Cutting speed (tours/mm)	Feed (mm/tooth)
HSSCO AR 12.0.5.5 (T1 5)	1	10-12	0.08
	4	8-10	0.12
	8	5-8	0.12

153 Rue Aristide berges 73000 CHAMBERY
Numéro SIREN : 788137461
Numéro SIRET : 78813746100042
Numéro TVA Intracommunautaire : FR50788137461

PRODUR ENGINEERED BY WELDING ALLOYS

Creusabro®

Industeel ArcelorMittal

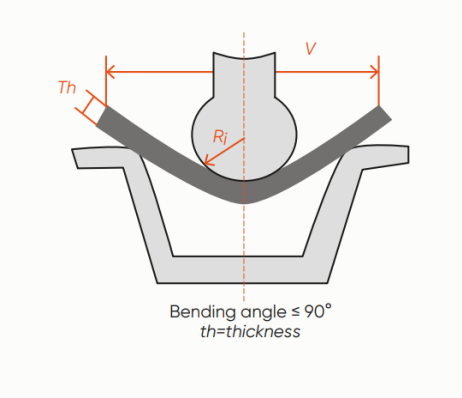
Cold forming can be done under the following appropriate conditions:

> edge preparation by grinding to remove flame cutting heterogeneities

> minimum internal bending radius (table below)

> Plate temperature > 10°C (50°F).

Forming



Internal bending radius (min.) th=thickness

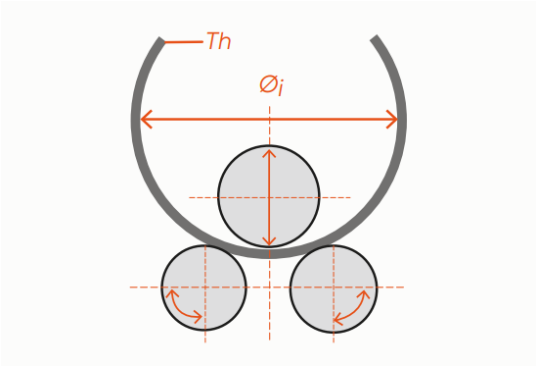
⊥ to rolling direction	Ri ≥ 5 th
// to rolling	Ri ≥ 6 th
Die opening V (mini)	V ≥ 14 th

According previous parameters, bending strength depends on bending length, thickness, die opening... Table here after gives indicative power needed to bend for a die opening of 14 times the thickness

Valeurs indicatives, pour l'ouverture de la matrice V = 14x (flexion en V)

Rolling

Th plates (mm)	Bending strength L = 1 m (ton/m)
10	200
20	430



Rolling shall be performed in following conditions : ØI ≥ 40 th (temperature of the piece ≥ 10°C - 50°F)

153 Rue Aristide berges 73000 CHAMBERY
Numéro SIREN : 788137461
Numéro SIRET : 78813746100042
Numéro TVA Intracommunautaire : FR50788137461

PRODUR ENGINEERED BY WELDING ALLOYS

Creusabro®

Industeel ArcelorMittal

Welding

Creusabro® 8000 (ISO/TR 15608 class 3.3) can be welded with all classical processes: manual, semi-automatic under gas protection, automatic under flux. For welds non subjected to wear, following welding products can be used:

Processes	AFNOR	DIN	AWS
Manual coated electrode	A81-309 E51 4/3B	DIN 1913 Class E51 43 B10	AWS 5-1Class E7016 or 7018
Semi - automatic Under gas	A81311 GS2	DIN 8559 SG2	AWS A-5-18Class ER70S4 or ER 70S6
	A81350 TGS 51BH TGS 47BH	DIN 8559 SGB1 CY 4255	AWS-5-20Class ER 71T5

For welds exposed to wear, please ask for advice on the choice of welding products and processes and parameters. Welded area must be free of grease, water, oxides…

As best practice, we recommend a minimum preheat of 120°C (250°F) to ensure the joint is dry.

Electrodes and flux shall be stoved according to supplier recommendations.

Following preheating conditions can be used when welding in a dry controlled environment and provided the weld joint is not subject to excessive stress.

Combined thickness mm (inch)									
Heat input (kj/cm)		20	30	40	50	60	70	80	90
Semi - automatic under gas	15								
	30								
Semi-auto. under gas	15								
	30								
Submerged arc welding	20								
	30								

Without pre - heating

Pre - postheating at 75°C (167°F)

Pre - postheating at 125°C (257°F)

PRODUR ENGINEERED BY WELDING ALLOYS

Creusabro®

Industeel ArcelorMittal

Applications

Creusabro® 8000 can be used with success in a wide range of application - as example:

> Bucket liners for excavator, shovel, loader, dozer, ...

> Cutting edges, stiffeners... for different types of buckets

> Truck tray body liners

> Wear parts for primary and secondary crushers

> Vibratory feeder liners

> Chute liners

> Hopper liners

> Screens

> Trommels

> Pipe elbows

> Cyclones

> Deflectors

> Grinder liners (SAG Mill)

> Demolition tools (recycling)

> Pipes for dredging

> Blade liners for heavy duty fans

> ...

153 Rue Aristide berges 73000 CHAMBERY
Numéro SIREN : 788137461
Numéro SIRET : 78813746100042
Numéro TVA Intracommunautaire : FR50788137461

PRODUR ENGINEERED BY WELDING ALLOYS