

Industeel



ArcelorMittal

# Steel Solutions for wear and impact resistant applications



# Our business

## Leading supplier of high quality steels

A subsidiary of ArcelorMittal, Industeel is dedicated to the production of hot rolled steel plates, ingots and formed pieces in the largest dimension range. Specialized in carbon and stainless steels, Industeel offers a complete range of high quality steel grades designed to meet the most severe specifications.

High quality materials designed to meet the strictest specifications

Efficient and reliable steel solutions delivered just-in-time by a global network of distributors

The widest dimensional range to meet all customer requirements thanks to our 3 integrated mills

A high level of technical support provided by a dedicated research & development centre

Electric arc furnace (capacity : 90 tons) ▼



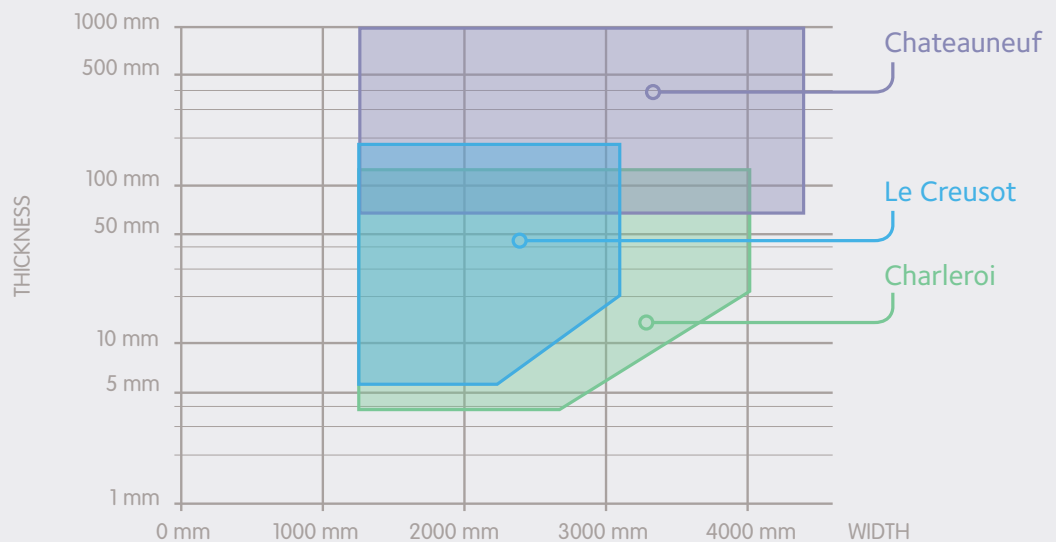
Bottom pouring ingots ▼



High level technical support ▼



The widest dimensional range



# Our expertise

## First-class producer of steel plates for abrasion and impact resistant applications

With over 150 years experience and a worldwide distribution network, the Industeel name stands for high performance steel at its best.

Careful selection of raw materials to produce **high purity steel** melt by electric arc furnace

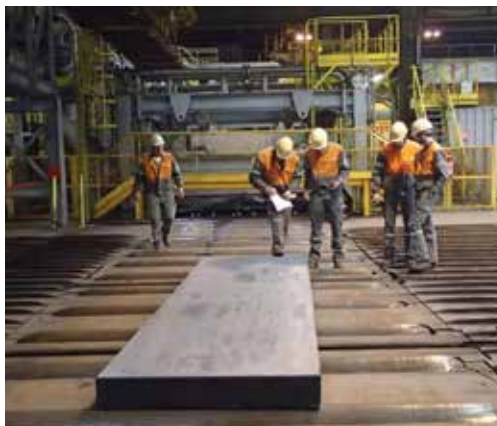
**Fine tuned secondary metallurgy**, vacuum and special degassing process for **high cleanliness steels**

Continuous casting or bottom-poured ingots program and **latest know-how techniques**

Computer controlled **4-high plate rolling mills**

Automatic quenching devices and high precision tempering furnaces to create **homogeneous hardness and microstructure** through the cross section

As a result, steel with uniform properties, **providing consistent performance in service**



It all starts with advanced metallurgical processes to produce premium steel



# Our added value

## Steel solutions for a competitive future

### Innovation

Our R&D Centre CRMC is a world-class facility with 50 researchers dedicated to our customers. We design new solutions to respond to specific market requirements with innovative and added-value products.

### Technical Assistance

Our team can give you technical assistance to take full advantage of selecting Industeel solutions.

### Laboratory Wear tests

Besides conducting expensive and time consuming full-scale wear tests on industrial equipments, we have used for many years various laboratory wear tests to compare different materials for a given application and to provide a rough estimate of wear performance.



#### ASTM G-65 Dry Sand Rubber Wheel

is a standardized test for studying sliding abrasion under moderate pressure.



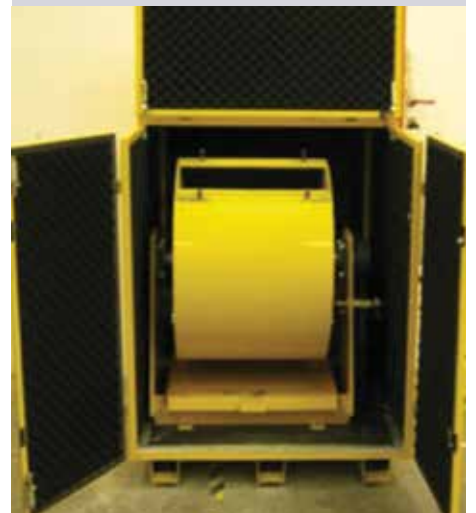
#### Dry- or slurry abrasion pot test

mixes sliding and impact conditions. A specimen is rotated in an abrasive grit and, if required, environment (liquid corrosion) which can be adapted to a specific application, at room or hot temperature up to 500°C.



#### Ball Mill Abrasion Test

is used to evaluate the resistance of metal alloys to high stress impact abrasion. Specimens are inserted in a rotating barrel with a charge consisting of steel or white cast iron balls a/o mineral rocks.



# High quality products, high value for our customers

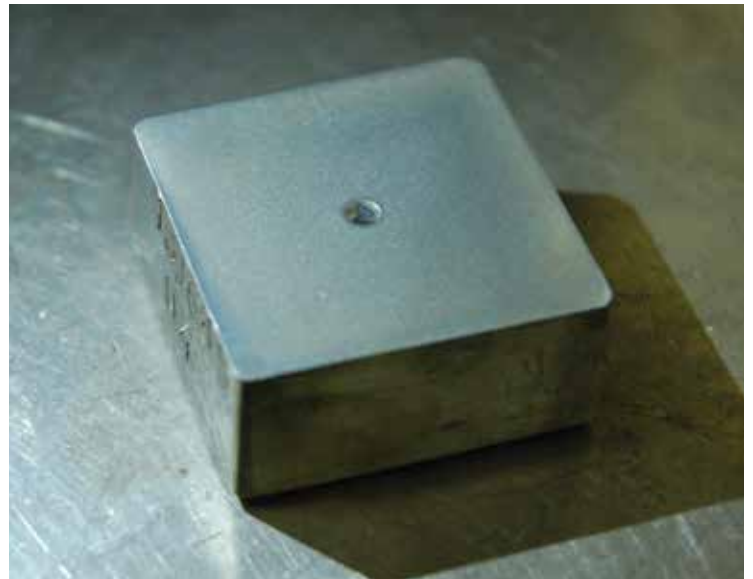
Our strength is a combination of correct materials selection, high level of technical expertise, flexibility and innovation, that will translate into appropriate use of high quality products and cost optimized solutions.

No one-fit-all product, but a **complete and flexible range of grades** to meet any situation.

**Technical assistance and tailor-made solutions** from our dedicated team of specialists.

**In-house R&D** to keep our products at the leading edge of innovation for quenched and tempered steels.

**Local and specialized distributors for expertise,** quick and reliable delivery and prefabrication services.



# Our products

## Relia® Quality Wear Resistant Plates

Relia® is a range of high hardness, conventional low-alloyed martensitic steels, which obtain their hardness through intense water quenching during plate manufacturing.

Available in 3 nominal hardness levels 400, 450 and 500 HB as cut-to-length sheets and quarto plates depending on dimensions

The Relia® Standard series offers entry-level products with the main emphasis on surface hardness

The Relia® Premium series is carefully optimised to offer superior properties and higher service level for easy and quick fabrication

Relia® steels can be readily welded using conventional techniques and low hydrogen consumables

TYPE	COMMERCIAL GRADE	THICKNESS <sup>(1)</sup> , mm	HARDNESS LEVEL, HB
STANDARD	Relia® 400	4 - 150	360-440
	Relia® 450	5 - 50	410-490
	Relia® 500	6 - 60	460-540

PREMIUM	Relia® 400 P	8 - 50	370-430
	Relia® 450 P	8 - 50	420-480
	Relia® 500 P	8 - 50	470-530

ALLOYED	Creusabro® Superten	50 - 180	300-380
	Creusabro® 4800	3 - 150	340-400 → 410-470 <sup>(4)</sup>
	Creusabro® 8000	4 - 100	430-500 → 500-570 <sup>(4)</sup>
	Creusabro® Dual	8 - 50	430-500 → 500-570 <sup>(4)</sup>
	Creusabro® M	4 - 120	520-600 <sup>(4)</sup>

Notes: (1) for other dimensions, please contact us ; (2) in the longitudinal direction ; (3) after prior agreement ; (4) surface hardness after work-hardening ; (5) thickness restrictions may apply, please contact us.

# Creusabro®

## Advanced Impact and Abrasion Resistant Steels

Besides the low-alloyed martensitic steels, Industeel has promoted for many years its exclusive and patented range of Creusabro® wear and impact TRIP-aided abrasion resistant steels. Perform well in a range of heavy duty applications with high loads and high impact conditions.

When in service, Creusabro® steels strongly improve their wear resistance by a **surface hardening effect** of about +70HB

Fine dispersion of **hard Ti, Cr, Mo alloyed carbides**, which enhance the resistance to slide abrasion

**Deep-hardened** plate with uniform properties and **low level of residual stresses**

As a result, **optimum combination** of wear resistance and processability for the most severe fabrication and operating conditions

CVN-IMPACT <sup>(2)</sup>	GENERAL DESCRIPTION
	<ul style="list-style-type: none"> <li>• Basic and versatile wear plate, with main emphasis on hardness level</li> <li>• Standard mill plate dimensions</li> <li>• Produced to order with standard mill delivery time</li> </ul>
-20°C min 27 J <sup>(3)</sup>	<ul style="list-style-type: none"> <li>• Narrow tolerances for hardness</li> <li>• Close chemical composition, adjusted depending on thickness</li> <li>• Deep-hardening ; through-thickness min hardness guarantee</li> </ul>
-20°C min 27 J <sup>(3)</sup>	<ul style="list-style-type: none"> <li>• Bending &amp; impact properties<sup>(5)</sup></li> <li>• Tight flatness tolerances 6 mm / 2 m</li> </ul>
-20°C min 27 J <sup>(3)</sup>	<ul style="list-style-type: none"> <li>• Tailored plate dimensions</li> <li>• Availability from mill stock for quick delivery</li> </ul>
-20°C min 32 J	<ul style="list-style-type: none"> <li>• Extra-thick wear plate with enhanced crack resistance</li> <li>• Guaranteed tensile properties YS ≥ 960 MPa ; TS ≥ 1050 MPa ; A ≥ 12%</li> </ul>
-20°C min 32 J <sup>(3)</sup>	<ul style="list-style-type: none"> <li>• TRIP-aided steels ; surface hardening +70 HB in service</li> <li>• Resistance to softening up to 450°C</li> <li>• Improved corrosion resistance in moderate environments due to Cr content</li> </ul>
-20°C min 32 J <sup>(3)</sup>	<ul style="list-style-type: none"> <li>• Ideal for hard rocks and high impact conditions</li> <li>• User-friendly ; ideal for complex fabricated parts</li> </ul>
	<ul style="list-style-type: none"> <li>• A variant of 8000-grade with enhanced erosion resistance thanks to coarse Titanium carbides reinforcement</li> </ul>
+20°C min 64 J	<ul style="list-style-type: none"> <li>• The genuine fine grained 12-14% Manganese (Hadfield) steel wrought plate</li> <li>• Hardness 180 - 245 HB as delivered</li> <li>• Guaranteed tensile properties YS ≥ 350 MPa ; TS ≥ 850 MPa ; A ≥ 30%</li> </ul>



# Our high performance steel solutions for wear and impact resistant parts

## EXCAVATING AND BULK HANDLING

**Excavation, hauling and bulk material handling** are the foundation of the mining, quarries and mineral industries. Reliable wear parts play a significant role to ensure safety and avoid costly machine downtime. In mobile equipments, payload and weight are also of primary concern to reach optimum operational performance.

Key requirements:

- Wear and impact resistance
- Quick and easy fabrication (in-field repair)
- Lightweight

### Steel Solutions

- > Creusabro® 4800, 8000
- > Creusabro® M
  
- > Relia® 400, 450, 500
- > Relia® Premium series

## CRUSHING AND SCREENING

**Raw mineral processing** includes a large variety of technologies for comminution and sizing. Combined with coarse and fine particles of different nature, multiple practical situations need to be solved to prevent excessive wear and ensure smooth and cost-effective industrial operation.

Key requirements:

- Impact and erosion resistance
- Quick and easy fabrication
- Corrosion resistance (wet processes)
- Dimensional stability

### Steel Solutions

- > Creusabro® DUAL
- > Creusabro® 4800, 8000
- > Creusabro® M
  
- > Relia® 400, 450, 500
- > Relia® Premium series

GENERAL

Many other applications in various sectors such as



## INDUSTRIAL HOT CONDITIONS

Heavy industries involving hot temperature processes such as **Power, Iron and Steel, Cement, Asphalt, Glass** and other minerals all benefit from the unique characteristics of our Creusabro® abrasion and temperature resistant products.

Key requirements:

- Impact and erosion resistance
- Temper resistance
- Workshop-friendly for complex fabricated parts

### Steel Solutions

- > Creusabro® 4800, 8000
- > Creusabro® DUAL

Temper resistant up to ~450°C

Conventional steels will lose their hardness above ~250°C

## DEMOLITION AND RECYCLING

Heavy duty **demolition equipment and recycling tools** are submitted to very severe service conditions, often combining abrasion and fatigue phenomenon induced by heavy cyclic loads.

Key requirements:

- Wear and impact resistance
- Toughness and crack resistance
- Fatigue strength

### Steel Solutions

- > Creusabro® SUPERTEN
- > Creusabro® 4800, 8000

- > Relia® 400, 450, 500
- > Relia® Premium series

## INDUSTRY

Dredging, Agriculture, Forestry, Pulp&Paper, etc.

# Key application areas

## EXCAVATING and BULK HANDLING



### Creusabro® 4800, 8000

Thanks to its original chemistry and advanced manufacturing process, Creusabro® 4800 and 8000 grades love hard digging and impact loads faced typically in hard rock mines.

- Longer service life by +50 to 100%
- Creusabro® 4800 outlasts 450 HB steel
- Creusabro® 8000 outlasts 500 HB steel

Creusabro® steels offers substantial weight savings potential for the same wear life as conventional low alloyed martensitic steels.

### Relia® Standard series

The use of Relia® 400, 450 and 500 plate will extend the service life of wear parts and machinery components over standard construction steel.

- Abrasion resistance 3 to 6 times higher than 355 MPa-class construction steel
- Easy to cut
- Dimensional range up to 150 mm for 400 HB-class

Dipper and Dragline buckets ▼



Haul Truck beds ▼



Shovel buckets ▼



Loader buckets ▼



Armoured face conveyors ▼



Ore skips ▼



# Key application areas

## CRUSHING and SCREENING

Primary and secondary crushers ▼



Feeders, vibrating grizzly feeders ▼



Chutes, Bins and Hoppers ▼



Rotary ball mills ▼



Auger screw conveyor ▼



### Relia® Premium series

The use of Relia® 400 P, 450 P and 500 P will extend the service life of wear parts and machinery components over standard construction steel, without sacrificing on quick and easy fabrication in the workshop.

- Tight tolerance for hardness
- Deep-hardening
- Enhanced bending & impact properties
- Excellent flatness tolerances 6 mm / 2 m
- Tailored plate dimensions
- Availability from mill stock

### Creusabro® DUAL

Creusabro®Dual is alloyed with high titanium content and produced by oil quenching. This innovative grade is mainly dedicated to severe sliding wear conditions for applications where conventional 500HB, 550HB steels, hardfacing, overlay plates or hard-cast parts are usually implemented.

Creusabro® Dual can be welded, drilled and machined, as well as being rolled, formed and fabricated.



▲ Comparison between Creusabro DUAL (left) and Chromium Carbide Overlay (right) specimens exposed to impact wear. No chipping to be seen!

Roll crushers ▼



Screen decks, gratings, breakers ▼



Impact crushers ▼



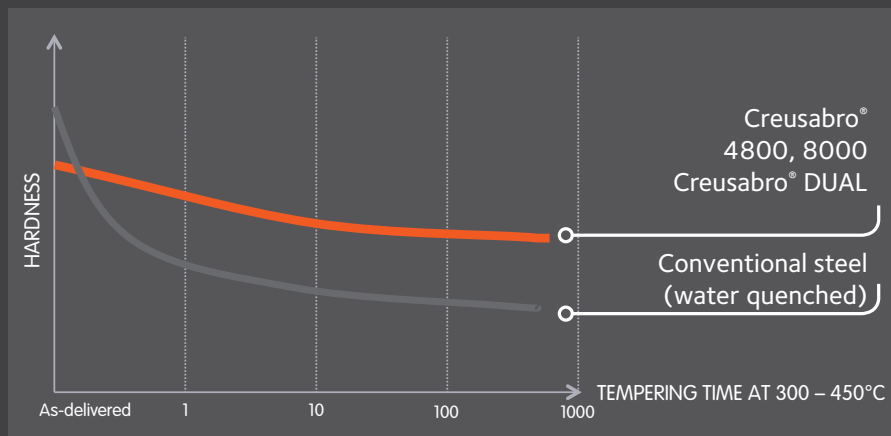
# Key application areas

## INDUSTRIAL HOT CONDITIONS

### Heat and wear resistance

Specific chemical composition and initial microstructure of Creusabro® grades result in a high resistance to softening compared to conventional steels.

- in-service temperature up to 450°C without sacrificing on wear resistance
- conventional water quenched steels will lose their hardness above 250°C.



Cement mills ▼



Coal-fired power plants ▼



Iron and Steel industry ▼



Hot slag tipper bodies ▼



Rotary drum dryers ▼



Dust and fly ash extraction pipes ▼



Elevator buckets ▼



Impeller fan wheel ▼



# Key application areas

## DEMOLITION and RECYCLING

Trommel screens ▼



Waste and scrap Shredders ▼



Scrap balers ▼



Scrap shears ▼



## Creusabro® Superten

Creusabro® Superten is used in massive structure components submitted to heavy loads in service, where high resistance to abrasion is required together with high toughness, crack resistance and a good workability.

- production range 50 to 180 mm,
- nominal delivery hardness of 340 HB
- guaranteed tensile and impact properties





Quality  
is our priority



# Where to find our steels

From our 40 sales agencies worldwide



## From our Creusabro® distributors

### **ABRASERVICE**

France, Germany, Austria, Czech republic, Belgium, Hungary, Italy, Netherlands, Poland, United Kingdom, Slovakia, Spain, Turkey.  
[www.abraservice.com](http://www.abraservice.com)

### **A. NAUMANN STAHL AG**

Germany  
[www.naumann-stahl.de](http://www.naumann-stahl.de)

### **ASTRALLOY STEEL PRODUCTS, INC.**

USA  
[www.astralloy.com](http://www.astralloy.com)

### **BERGS MEKANISKA**

Sweden, Finland, Norway  
[www.ny.bergsmekaniska.se](http://www.ny.bergsmekaniska.se)

### **MACSTEEL VRN**

South Africa  
[www.macsteel.co.za/business-unit/macsteel-vrn-0](http://www.macsteel.co.za/business-unit/macsteel-vrn-0)

### **PT TIRA AUSTENITE TBK.**

Indonesia  
[www.tiraaustenite.com](http://www.tiraaustenite.com)

### **SCHLEISNER FLAME & PLASMA CUTTING LTD.**

Israel  
[www.schleisner.com/en](http://www.schleisner.com/en)

### **STULZ-SICKLES STEEL CO.**

USA  
[www.stulzsicklessteel.com](http://www.stulzsicklessteel.com)

### **TECHNIQUE ACIERS**

Morocco  
[www.techniqueaciers.ma](http://www.techniqueaciers.ma)

### **TITUS STEEL CO. LTD**

Canada  
[www.titussteel.com](http://www.titussteel.com)

### **VULCAN STAINLESS**

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[www.vulcansteel.com](http://www.vulcansteel.com)



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transforming  
tomorrow

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