

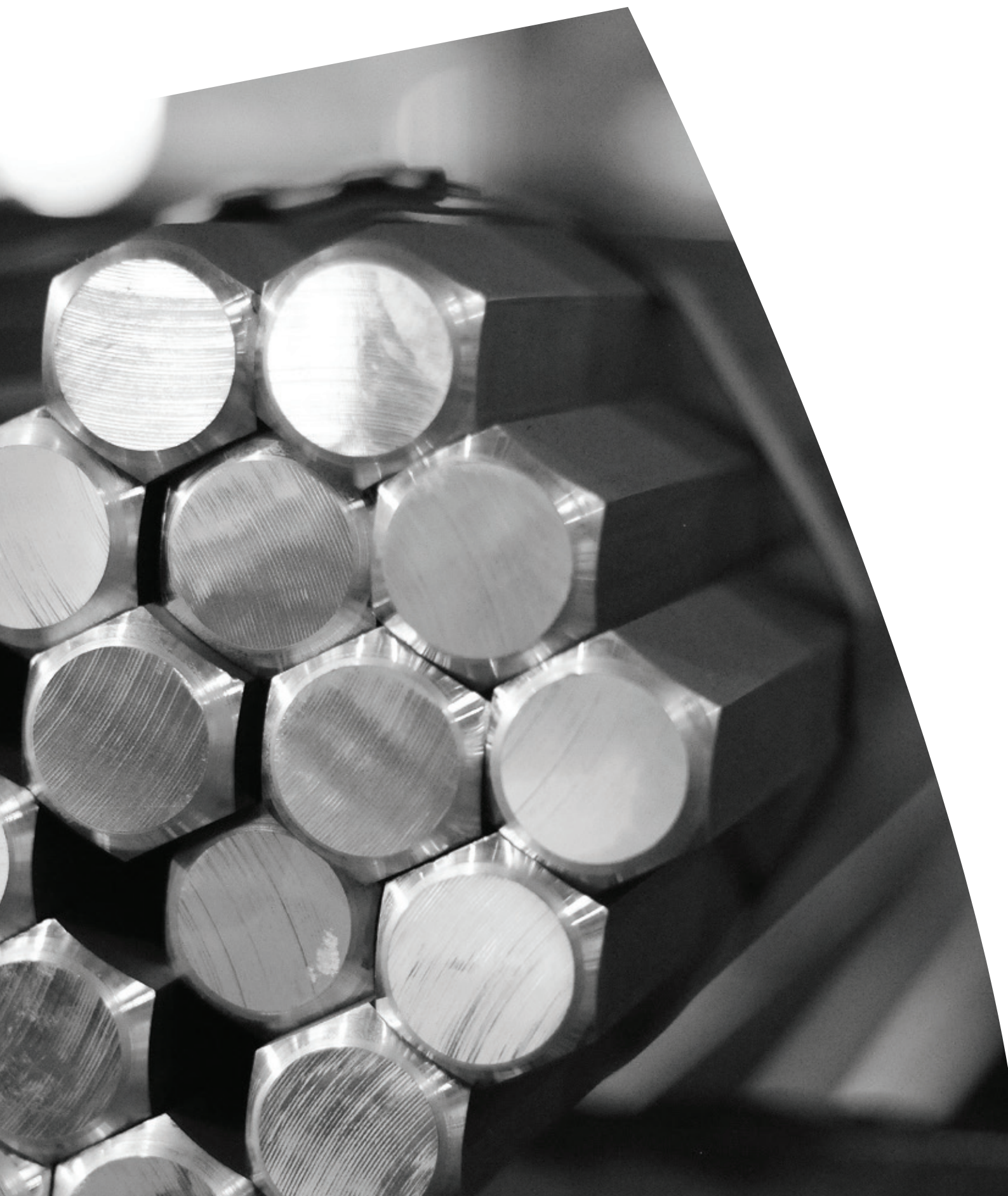
ArcelorMittal WireSolutions



ArcelorMittal

# Bright Bar Solutions





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# Introduction

ArcelorMittal Bright Bars, part of the ArcelorMittal Group - the largest steel company in the world, is a global leader in the manufacture and distribution of bright steel bar products.

Bright bar production by ArcelorMittal is used in applications where there is a need for high surface quality and precision geometry. Our highly developed and finely tuned processes (cold drawing, peeling, grinding, turning or a combination of these processes) enables us to offer best-in-class properties in a wide range of solutions, sizes and grades for many applications.

- › **Mechanical engineering**
- › **Automotive**
- › **Construction**
- › **Electrical equipment**
- › **Agriculture**
- › **Others.**

The automotive industry accounts for 75% of ArcelorMittal Bright Bars' production. The remaining production output is used in the Mechanical engineering industry, Hydraulic industry, Agriculture, Construction and Stockholder industries.



# Revigny in France. Dortmund in Germany. Two sites. One vision.

The combined strength of ArcelorMittal's production facilities in Revigny, France and Dortmund, Germany make ArcelorMittal Bright Bars the supplier of choice amongst Automotive, Construction, Electrical equipment, Agricultural and Mechanical engineering industries around the world.

Driven by our vision of transforming tomorrow, and supported by our vertically integrated business model, as well as our world class research and development facilities based in Maizières, France, our teams of technical experts based in Revigny and Dortmund are well placed to meet your technical requirements.

Dortmund, Germany



Revigny, France



## Revigny, France.

- › 5 integrated drawing units, transforming coils to bars. Round bars: Ø 5 to 50mm  
Hexagonal: Ø 5 to 41 mm
- › 1 bar to bar drawing bench up to Ø 80mm
- › Integrated chamfering machine and Eddy current control in each drawn line
- › 4 centreless grinding machines
- › 1 Off-line surface control + Ultrasonic, FBH (KSR) Ø 0.7mm, and surface control
- › 1 Peeling line, Ø 20 - 100mm
- › Production capacity of 100,000 tons per year
- › 90 employees.

### History

- **1960:** Creation of the "Société. Métallurgique de Revigny"(SMR) by Giros and SAFE
- **1970:** SMR develops "torsion bar" activity at request of Renault
- **1982:** Purchase of SMR by the Sacilor group
- **1985:** SMR becomes a subsidiary of Ascometal (Sacilor group)
- **1986:** Usinor and Sacilor merge. SMR becomes a subsidiary of the Usinor-Sacilor group
- **1991:** SMR sells its "torsion bar" business to Allevard
- **1999:** ISPAT buys SMR
- **2005:** ISPAT becomes Mittal Steel
- **2006 and 2007:** Arcelor and Mittal Steel merge. Mittal Steel launches its successful bid for the Arcelor group. Several subsidiaries were then created, including "WireSolutions" (drawn solutions). SMR becomes ArcelorMittal Revigny (AMR), becoming part of ArcelorMittal WireSolutions.

## Dortmund, Germany.

- › 8 hectares
- › 9 drawing lines (from Ø 5 to 31mm) and hexagon up to 31mm, including chamfering
- › State of the art Eddy current surface inspection for round and hexagon products
- › Ultrasonic control (in 2023)
- › Lengths above 10m please contact us
- › Production capacity of 94,000 tons per year
- › 83 employees.

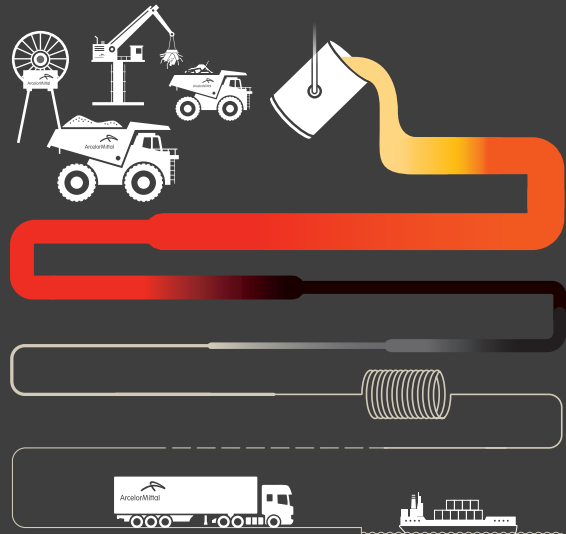
### History

- **1975:** Foundation of predecessor company Pottschull Blankstahl GmbH in Dortmund
- **1986:** Company name changed from Pottschull Blankstahl GmbH to Dortmunder Blankstahl GmbH
- **2003:** Certification according to DIN EN ISO 9001 Quality Management
- **2011:** Acquisition of 20,000m company premises Germaniastr. 54
- **2021:** ArcelorMittal acquires the companies' assets, forming ArcelorMittal Dortmund GmbH.

# Vertical integration

Worldwide, customers can rely on our supply chain integration, expertise and technical knowledge. We are well placed to support our customers to identify the best possible solutions. Ranging from the development of bespoke specialist steel grades, we offer solutions that meet our customers precise requirements.

## Vertical integration. Unparalleled value.



Our vertically integrated business model provides customers with the peace of mind necessary to enable them to confidently purchase our products. Our vertical integration enables us to quality assure our raw materials, ensure consistency and stability in the production process and deliver outstanding results that meet our customers' diverse needs and provide value for money.







# Research and Development

With an expanding network of over 1,300 full-time researchers in 12 research centres across the globe, ArcelorMittal's technical research and product development teams are committed to improving steel processing and engineering, always aiming to develop new solutions that will address future market needs. Furthermore ArcelorMittal develops new solutions for **ImMAC®-Grades** (Improved **MAC**hinability).

The R&D missions of the group :

- › **A proactive approach to the future needs of our customers**
- › **Development of products, solutions and processes - from pre-design to implementation**
- › **Assistance to plants for complex technical issues.**



1,300 full time  
researchers



12 research  
sites



US \$ 270 million  
spending in total in  
2021, of which around  
85% is spent in Europe



## Quality control and testing

Each ArcelorMittal Bright Bars product is subject to continuous monitoring during its production process, including:

- › **Automatic control of the raw material**
- › **Online non-destructive testing (eddy current)\***
- › **Tensile test, and mechanical characterisation.**

Our control lines are regularly updated to offer increased levels of precision and efficiency.

\*Online non-destructive testing is made up of the following elements:

- › **An encircling coil eddy current control**
- › **Ultrasonic only outline.**



# Outline control

- › Rotating Eddy Current Control round  $\varnothing$  12 to 80mm
- › Encircling Eddy Current Control round  $\varnothing$  12 to 30mm
- › Encircling Eddy Current Hexagon  $\varnothing$  27 to 50mm
- › Ultrasonic Control round only  $\varnothing$  12 to 52mm.



# Certification and Accreditation

ArcelorMittal Bright Bars, Revigny is certified as follows:

- › ISO 9001
- › ISO TS 16949 (now IATF):  
Automotive certification 2002
- › OHSAS 18001
- › ISO 14001
- › ISO 45001
- › ISO 50001
- › We supply all goods with a certificate according to the EN 10204-3.1.

ArcelorMittal Bright Bars, Dortmund is certified as follows:

- › ISO 9001
- › ISO 50001

*Planned for November 2022:*

- › Certification according to IATF 16949
- › Certification according to ISO 14001
- › Certification according to ISO 45001





# Product Range

- › XCarb™
- › Improved Machinability Steel
- › Quenched and Tempered Steels
- › Bainitic Steels
- › Spring Steels
- › Case Hardening Steels
- › Bearing Steels
- › Carbon Steels
- › Usimax®

# Product Range

The main steel grades used, refer to European standards, as follows: EN 10277. The various steel grades are sold as drawn, peeled or grinded profiles, with or without chamfering. ArcelorMittal is also able to provide specific profiles (simple forms).

ArcelorMittal Bright Bars offers an extensive range of products including:

- › **Low carbon steel for free cutting with sulphur, with or without lead**
- › **Free cutting steel grades for heat treatment**
- › **Carbon grades, with or without lead**
- › **Alloyed grades.**

## Product range

### 1. Drawn profiles (3 to 7m length)

Round from 5 to 80mm;  
hexagons from 5 to 75mm  
Cut to lengths

*For more details please consult us.*

### 2. Grinded profiles (1.5 to 7m length)

Round from 5 to 50mm

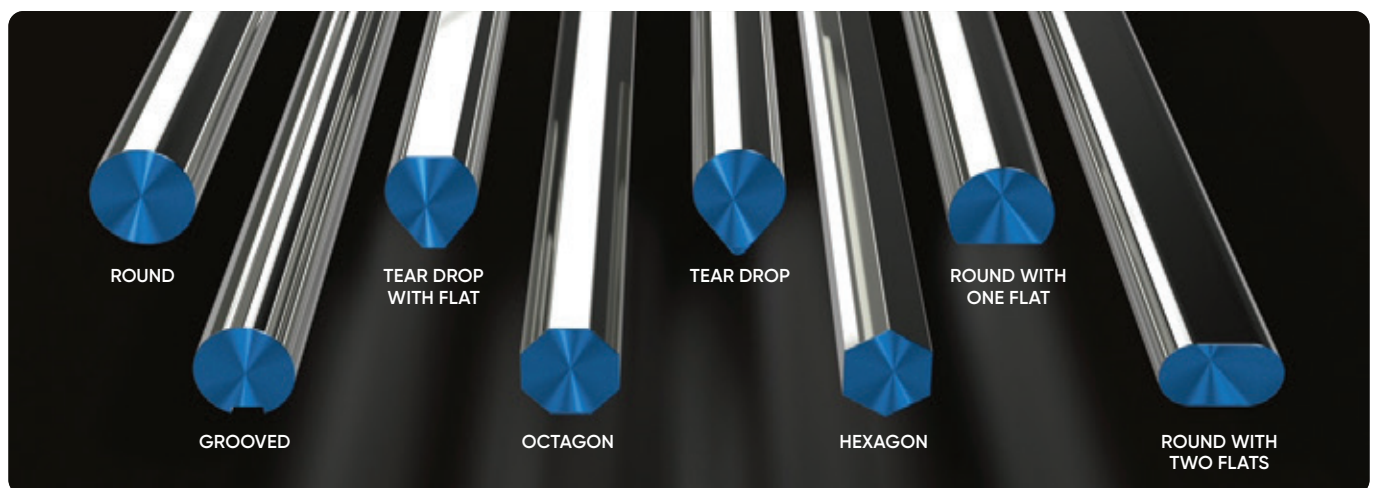
### 3. Peeled bars (3 to 8m length)

Round from 20 to 100mm  
(H9 Tolerance possible).

## Tolerances

Tolerance of the dimension:  
Quality 8, 9, 10 and 11

Endings dressed, chamfered, sawn, etc.



ArcelorMittal Bright Bars offers a wide range of steels for various uses and in different profiles (round, hexagon, square, etc.)



# XCarb™

Towards carbon neutral steel



*"We have an important role to play in helping society deliver the objectives of the Paris agreement and are determined to lead our industry's transition to CO<sub>2</sub> neutral steel."*

**Aditya Mittal,**  
CEO, ArcelorMittal

## Towards CO<sub>2</sub> neutral steel with XCarb™

Our new brand, XCarb™ is designed to bring together all of ArcelorMittal's reduced, low and zero-carbon products and steelmaking activities targeted at CO<sub>2</sub> neutral steel by 2050.

## Our first two XCarb™ products are now ready for market:

XCarb™ recycled and renewably produced applies to products made via the Electric Arc Furnace route using scrap steel and 100% renewable energy, giving our finished steel products an extremely low CO<sub>2</sub> footprint.

All of the electricity needed to transform the scrap into XCarb™ recycled and renewably produced steels comes from renewable sources such as solar and wind power. The energy is provided by suppliers who are connected to the same grid as our production sites and whose projects are recent.



# Product Range

## Improved Machinability Steel



Improved Machinability Steel grades have small amounts of additional alloying elements to improve machinability. Alloying elements are added during secondary steelmaking specifically to modify the steel inclusion population.

Some elements are forming controlled inclusions to promote chip formation and break-up during subsequent machining, while others melt locally at the tool/work piece interface acting as a lubricant and reducing tool wear. Possible additions include sulphur, lead, tellurium, bismuth and selenium.

Usimax <sup>®</sup> D10	11SMnPb30	38SMn28	C15Pb
Usimax <sup>®</sup> D38	11SMn37	35S20	C35Pb
Usimax <sup>®</sup> D950	11SMnPb37	46S20	C45Pb
11SMn30	36SMnPb14	44SMn28	

## Quenched and Tempered Steels



Quenched and Tempered Steel grades have greater hardenability than structural carbon steels. The grades contain specific amounts of alloying elements to favour transformation of austenite into martensite during the quenching process.

C35 to C60	41CrS4	Up to 30CrNiMo8
34CrS4	42CrMoS4	

## Bainitic Steels



Bainitic Steels are designed for applications requiring a good compromise between tensile strength and ductility. Bainitic steels offer the added benefit of eliminating the final quench and tempering process which is usually undertaken to achieve high properties. Controlled cooling after hot forming steers the austenite transformation into the bainitic region. The fine-tuning of alloying elements enables the product to reach the desired level of strength.

SOLAM® B1100 BB

SOLAM® B1150 BB

SOLAM® B1200 BB

## Spring Steels



Spring Steels are Medium or High carbon steels with very high yield strength. This property allows the part formed grades to return to their original shape after significant bending or twisting.

The principal alloying elements to achieve the high yield strength are silicon and manganese. For very demanding applications, these grades are processed within tightly controlled conditions, delivering excellent fatigue behaviour.

51CrV4

54SiCr6

# Product Range

## Case Hardening Steels



Case Hardening Steels are used for component parts requiring high surface wear resistance whilst retaining a soft core that absorbs stresses without cracking.

The grades are Low Carbon steels with the addition of suitable alloying elements. These additions typically include chrome and manganese, but nickel and molybdenum can be used to increase the through-hardening for larger cross-sections. A special characteristic of this grade is the Jominy curve, which needs to be well controlled. These grades can be supplied with or without annealing (FP).

20Mn5	20MnCr5	14NiCr14	17CrNi6	14NiCrMo13
16MnCr5	20MnCrS5	18NiCrMo6	18CrNi8	23MnCrMo4
16MnCrS5	25MoCr4	15CrNi6	17Cr3	17CrNiMo6
16MnCrS5Pb	12NiCr3	16CrNi4	20NiCrMo2	

## Bearing Steels

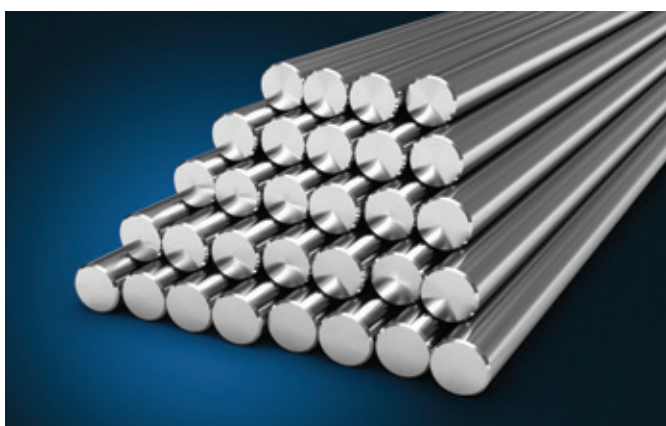


Bearing Steels are High Carbon grades with very high mechanical properties and wear resistance that is achieved by quenching and tempering. Depending on the type of application, different levels of cleanliness will be required to avoid inclusions that initiate fatigue during rolling contact.

100Cr6	100CrMn6	100CrMo7	C70
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## Carbon Steels



C10 to C25

C30 to C60

Carbon Steel grades are the combination of three families: Low, Medium and High Carbon:

- › **Low Carbon steels:** Carbon range between 0.1 to 0.25%. One of the most common type of steel used for general purposes, these are inherently easier to cold-form and handle (draw, bend, etc.) due to their soft and ductile nature.
- › **Medium Carbon steels:** approximately 0.30 to 0.59% carbon content. These steels can be heat treated to provide a good balance of ductility and strength. Typically used in large parts, forgings, machining and automotive.
- › **High Carbon steels:** above 0.60% of carbon content. High tensile and yield strengths. Used for applications in which high strength, hardness and wear resistance are necessary (e.g. wear parts, gear wheels, chains, brackets).

# Product Range

## Usimax<sup>®</sup>

### Usimax<sup>®</sup> – A bespoke solution

Usimax<sup>®</sup> is a metallurgical concept based on inclusion population control, chemical composition and microstructure optimisations that is applied on a wide variety of free-cutting steels to bring outstanding and customised performance to our customers.

### Benefits of Usimax<sup>®</sup>

- › Optimised production costs
- › Consistent quality throughout long tool life
- › Low energy consumption achieved through low cutting forces
- › Higher productivity
- › Increased cutting speed
- › Quick and easy removal of short chips from machine tooling
- › Superior surface quality
- › Environmentally friendly.

### Usimax<sup>®</sup> performance illustrates

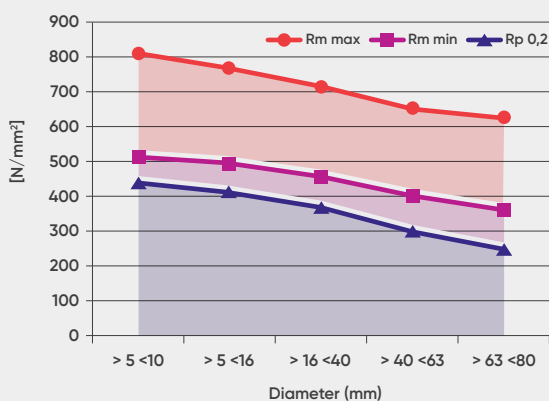
- › Good lubrication at the tool-chip interface due to a faster creation of the build-up layer
- › Cutting temperature kept at a lower level
- › Reduced tool wear
- › Increased cutting speed
- › Short chips.



## Usimax® D10

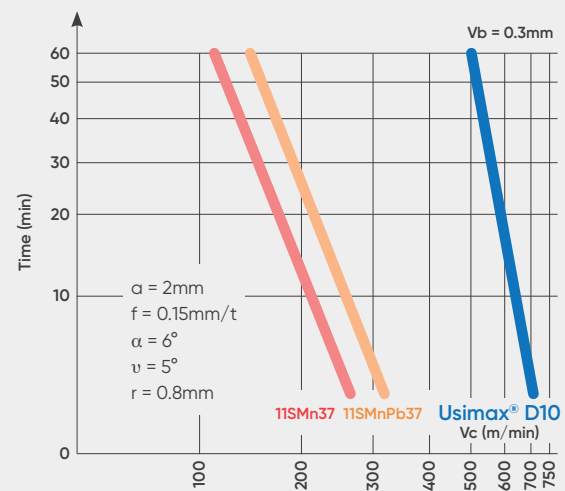
Usimax® D10 is a steel containing sulphur developed from a new metallurgical concept based on the control of inclusions. Usimax® D10 is comparable to the designation AFNOR S300Si. When used, it fundamentally alters the wear mechanism of the cutting tool by creating a protective barrier at the tool/chip interface. Combined with suitable choices of tools and cutting speeds, Usimax® D10 avoids the use of lead for the most demanding machining operations. Control of this type of inclusions is a competitive advantage under optimum usage conditions. It improves productivity and increases cutting speeds in comparison to standard sulphur lead steels.

### Mechanical characteristic



### Machining/Productivity improvement

Taylor curves with P30 carbide tool  
(with-out lubrication)



	11SMn37	11SMnPb37	U®D10
V20 Vb 0.3*	180	220	540

\* Cutting speed leading to flank wear  $V_b = 0.3\text{mm}$  after 20 min of machining

The graph above shows the machining performances of Usimax® D10 compared to those of a 11SMnPb37 and a 11SMn37 in the form of a Taylor curve. These tests were performed in accordance with the ISO 3685 standard on Ø 90mm mill finish samples, using flank wear  $V_b = 0.3\text{mm}$  max. as the end-of-test criterion.

On Usimax® D10, the values V20 Vb 0.3, reveal permissible cutting speeds which are 2.5 to 3 times higher than those of 11SMn37 and 11SMnPb37 grades.

Thanks to its exceptional machining properties at high cutting speeds (using P carbide tools) Usimax® D10 can satisfy and even anticipate developments in the machinery used by a profession increasingly focused on optimising productivity.



# Product Range

## Usimax® D38

Research work in machinability carried out within the ArcelorMittal Group reinforced the benefits of controlling inclusions (nature, size, shape and distribution of non-metallic inclusions), as well as the precipitation hardening of steels involving finely dispersed phases.

It is on this basis that Usimax® D38, semi-hard free cutting steel for heat treatment was developed.

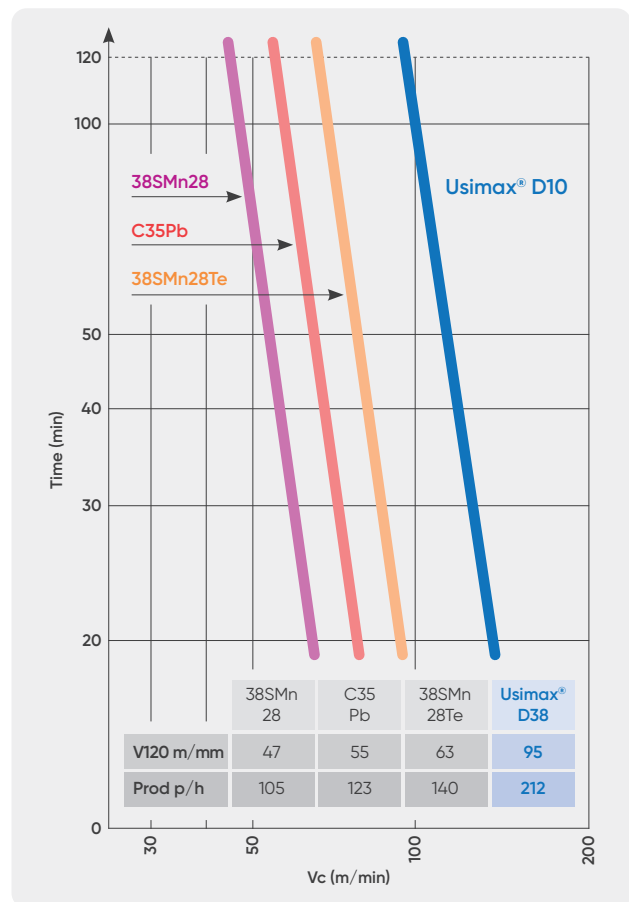
Usimax® D38 comes under the range of “direct hardening steel for free cutting” in the standard EN10087. Utilising our Usimax® production process specially developed for this family of steels, Usimax® D38 provides exceptional cutting performance under a variety of machining conditions.

The machining processes used by bar turners implement very different cutting speeds and types of tools.

The metallurgist therefore has to adapt the type of inclusions in the steel:

- › For low and medium-speed machining with high-speed steel tools for which the quantity and morphology of the sulphides makes a significant difference
- › For high-speed machining with carbide tools for which the favourable effect of the sulphur is less marked, the configuration and nature of the oxides linked to the deoxidisation of the steel become decisive.

The production of Usimax® D38 steel is performed so as to obtain maximum gains in productivity in both cases.



## Usimax® D950

A high strength free cutting steel that is "ready for use". "Ready for use" bars are delivered in the necessary final condition, providing the refiner with an alternative to the classic manufacturing cycle, particularly:

- › Reduced quantity of metal free from surface defects and decarburisation associated with hot rolled products giving reduced machining cost
- › No heat treatment
- › Homogeneous features on the whole product
- › Simplified manufacturing cycles produced to very close tolerances and surface finish, suitable for use in the finished condition, offering reduced process costs and lead.

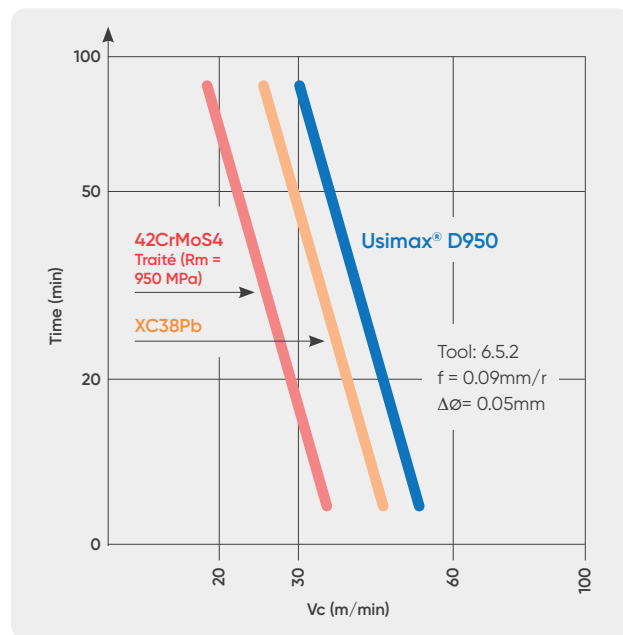
Usimax® D950 is a drawn, high strength free cutting steel with no need for heat treatment, combined with excellent machinability for reduced through cost (over machining may compromise these savings).

Usimax® D950 has advanced mechanical features providing a high standard of machining performance.

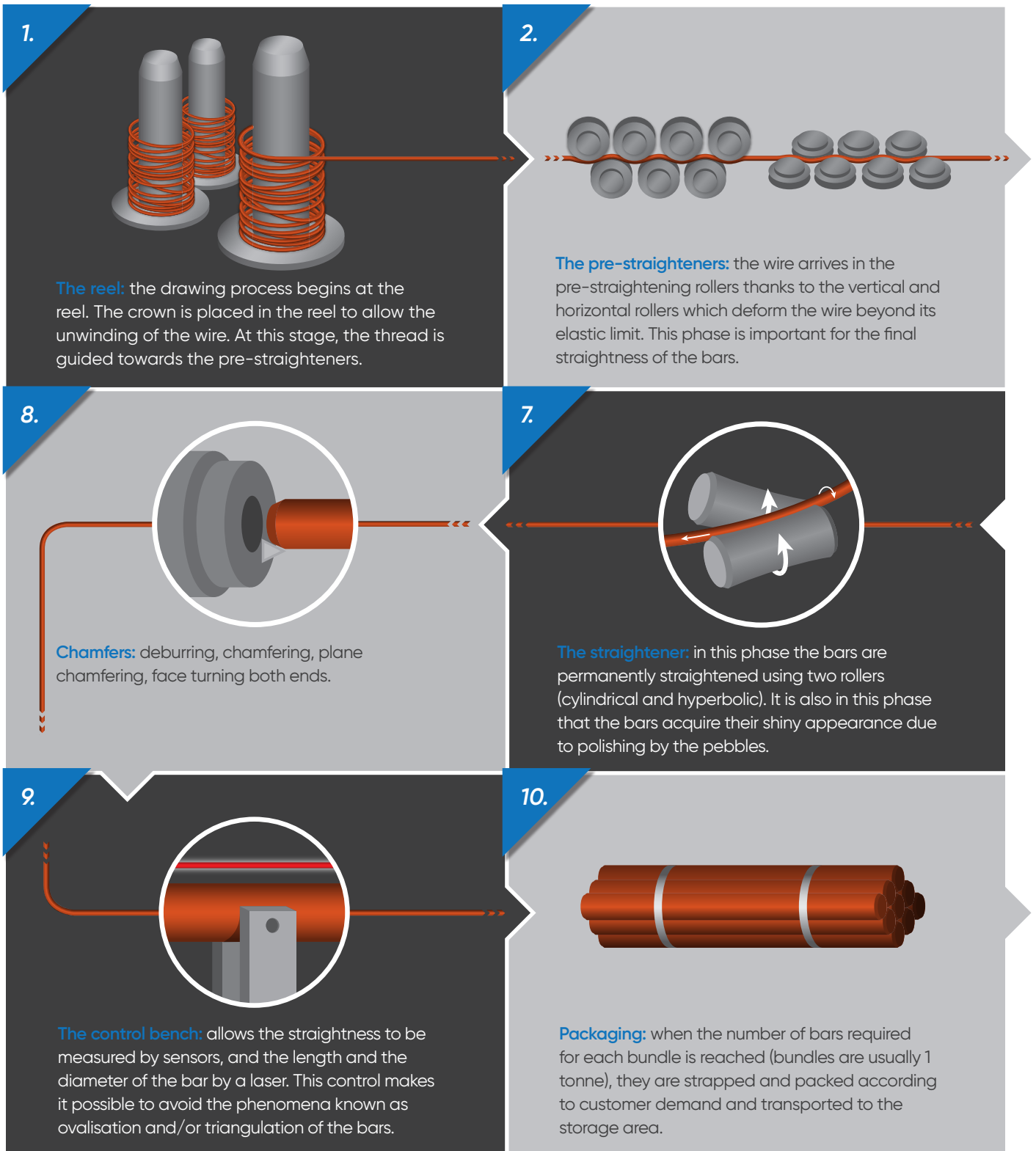
### Advanced mechanical features

High standard of machining performances. As an example, for a lining operation, Figure 01 shows that the performance obtained is:

- › Much higher than that of mechanical structural steel with improved machinability treated for the same strength level (42CrMoS4 re-sulphurised to 0.080%): the increase in productivity is between 30 and 35%
- › Totally comparable to that of XC38 Pb steel, in its raw drawn state. Identical results were obtained both in laboratory and industrially for the operations (turning, cutting, drilling, etc.).

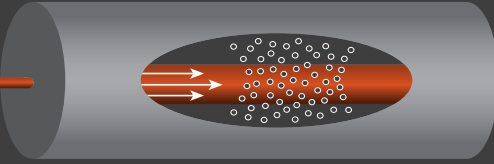


# The Production Process



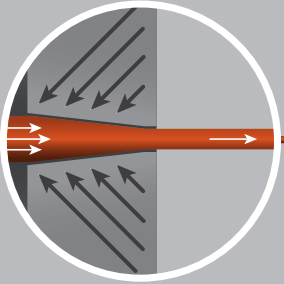


**3.**



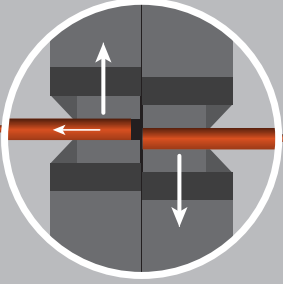
**The shot blasting:** the purpose of the shot is to eliminate the scale on the surface of the wire in order to obtain a suitable drawing surface of the metal. Shot blasting therefore consists of projecting balls of shot using a turbine shot blaster.

**4.**



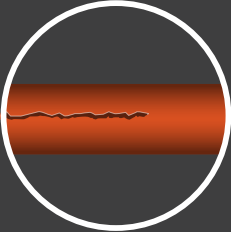
**The die:** is one of the most important parts of the drawing process because it is during its passage through the die that the wire takes on its diameter and its final shape.

**6.**



**Shearing:** this operation uses hydraulic shears to cut the wire into bars. The shear is mobile to allow the wire to be followed to keep the process continuous.

**5.**



**Eddy Current device inspection:** after drawing, the bar passes into the eddy current inspection. This passage makes it possible to detect short (small) faults present on the bars. This control is carried out by two encircling coils which detect surface defects using electric current. If a defect is detected, the bar will be automatically scrapped at the exit of the straightener.

**11.**



**Storage:** the storage of burdens is done on harrows reserved for this purpose. To optimise this operation, the bundles are stored with an identification label containing information on the product but also on the customer for whom it is intended.

# Our services

ArcelorMittal Bright Bars offers an extensive range of services including:

- › **Cut to length for requirements**
- › **Tailored packaging options**
- › **Group metallurgical expertise for specific applications or production process are available to support our customers.**

## Logistics and Fulfilment

ArcelorMittal Bright Bars' products are available for despatch in different packaging.

On request, we can protect the bundles with plastic wrapping, or place them into wooden crates.



## Identification

All our material is individually identified with labels referring to: steel grade, dimension, lot number, batch number, bundle number and weight.

ArcelorMittal Bright Bars has a permanent stock of standard products. Our logistics teams deliver products worldwide by air/rail freight, road freight or by container.



# Why choose ArcelorMittal Bright Bars?



ArcelorMittal is a leading Metals & Mining company offering wide ranging and technically advanced solutions.

We combine the sustainable development of steel with social and environmental responsibility.

Our quality standards are recognised worldwide.

Our program of continuous training and development enables the transfer of knowledge and expertise between senior engineers and apprentices.

- › **Quality Assurance:** We operate at the leading edge of new technological developments, ensuring that our controls and testing are some of the most robust in the industry, giving our customers the confidence and peace of mind to use our products
- › **Reliability:** We are trusted the world over. 60 years of successful manufacturing of premium quality products has earned us a worldwide reputation as a supplier of choice in all markets
- › **Customer focused:** Our customers are central to our business, and we work with them to develop and deliver the solutions that they need to succeed
- › **Expertise:** We continue to build on our long-standing experience and knowledge, learning and applying our discoveries for the benefit of our customers
- › **Innovation:** We continuously develop and adapt our sourcing, processing, production, and logistical methodologies to address the constantly shifting requirements of the markets in which we operate
- › **Responsibility:** We are accountable, and we ensure that our practises are built around the needs of the environment, our customers and our people.





# Why choose ArcelorMittal Bright Bars?

We operate integrated management systems for Health & Safety, Quality, Environment & Energy.

Superior quality control: from eddy currents (surface defects) and spectrometer, to ultrasonic control (internal defects).

State of the art laboratory testing (hardness, tensile, metrology, metallography tests).

We carry a wide range of products and profiles.

We carry an extensive range of steel grades:

- › **Carbon steels**
- › **Steels with improved machinability**
- › **Steels with very high mechanical resistance**
- › **Quenched and tempered steels, bearings, springs, carburising**
- › **Alloy steels.**

We utilise horizontal supply chain concentration:

- › **3 steelworks: Hamburg, Duisburg, Warsaw**
- › **3 rolling mills: Duisburg, Warsaw, Gandrange, Hamburg**
- › **Final production: Revigny and Dortmund**
- › **Group R&D centre in Maizière.**

We carry stocks of "standard" products enabling:

- › **Reactive fulfilment**
- › **Fast delivery**
- › **Immediate dispatch of many diameters.**

We are ideally located to cover the European markets:

- › **Deliveries by truck all over Europe**
- › **Containers for export customers**
- › **Additional warehouse based in Vougy, Haute-Savoie close to the centre of the turning companies industry in France.**







# ArcelorMittal

## Contact

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