



ArcelorMittal

## Dimensional program

Industeel produces TENASTEEL® in different shapes :

Plates	2000 x 4000 mm - Thicknesses 15 to 75 mm 6.56' x 13.1' - Thicknesses .59 to 2.95"
Bars	Width 500 mm x Thicknesses < 300 mm Width 19.7" x Thicknesses < 11.8"

For non standard sizes or shapes,  
please consult us.  
(including castings and forgings)

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



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

GEBRÜDER  
**RECKNAGEL**  
*Präzision in Stahl*

**Stock:**  
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D-98547 Christes

Phone: +49 36844 480-0  
e-Mail: [grp@stahlnetz.de](mailto:grp@stahlnetz.de)  
**WebShop: [www.stahlnetz.de](http://www.stahlnetz.de)**

MKT Special steels - 12-2010 issue



Industeel

ArcelorMittal



**TENASTEEL**®

Cold work tool steel



# A multi-purpose cold work tool steel



## Looking for a new concept

Materials are in evolution and rates of production increasing. Consequently, cutting and stamping tools need to be made from a tool steel with a reduced risk of cracking and chipping.

At present, a difficult compromise has to be made, using

- Conventional steels which require a choice between wear resistance and toughness
- Powder metallurgy steels which are multi-purpose steels, but expensive.

This requires the development of a new, more universal steel concept, able to couple high tensile strength with wear resistance.

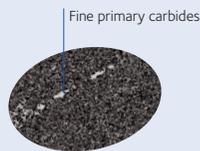
TENASTEEL<sup>®</sup> has been designed to answer these demands.



- Elaboration in electric furnace, vacuum refining,
- Specific and innovative chemical balance,
- Capable of standard heat treatments.

TENASTEEL<sup>®</sup> allows an increase in tooling productivity with lower maintenance costs.

It is especially suited to surface treatments and surface coating.



## A new chemical balance

Low level of carbon and chromium with titanium additions produce a finer carbide structure. Molybdenum additions maintain the wear resistance structure.

	C	Mn	Cr	Mo	V	Others
TENASTEEL <sup>®</sup>	1	0.35	7.5	2.6	0.3	Ti
X160 CrMoV12 - D2	1.60	0.35	12.0	0.75	0.95	-

## Improved mechanical characteristics

Annealing Hardness	Austenitization temperature	Double tempering temperature	Hardness after treatment	Toughness* TENASTEEL <sup>®</sup> X160 CrMoV12-D2
≤255HB	1050°C	525°C	60/62 HRC	20 J
		550°C	59/61 HRC	30 J
		575°C	58/60 HRC	35 J
≤255HB	1922°F	977°F	60/62 HRC	14.7 ft.lbs
		1022°F	59/61 HRC	22.1 ft.lbs
		1067°F	58/60 HRC	25.8 ft.lbs

\* Typical values on unnotched specimen for thickness < 100mm (4")

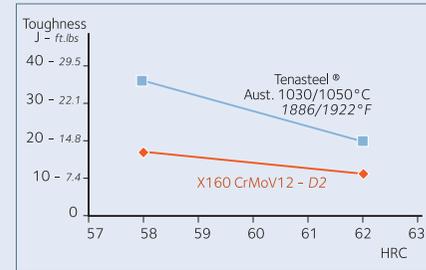
TENASTEEL<sup>®</sup> is Trademark and Patented grade

## Better tool performance

### Cracking resistance

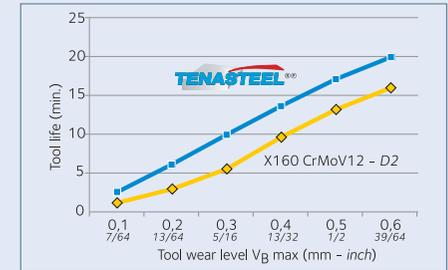
Whatever the hardness, TENASTEEL<sup>®</sup> offers double the toughness of X160 CrMoV12 - D2.

- Less sharpening,
- Less in-service cracking.



### Improved machinability

Increasing tool life

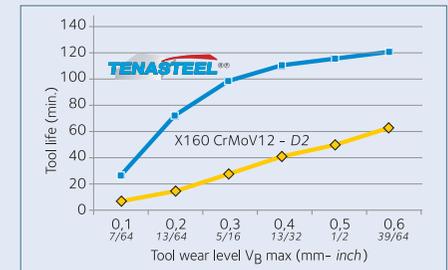
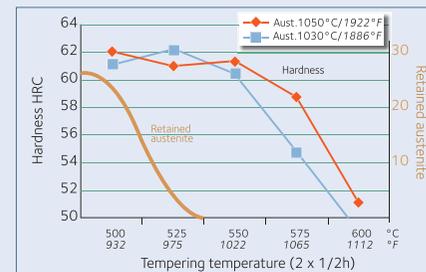


Test on annealed sample

### Versatile treatments

Treatments at high temperature are possible with TENASTEEL<sup>®</sup>.

- Compatible with all surface treatments or coatings (PVD type),
- Ensures better dimensional stability.



Test on hardened sample

